A REVISION OF THE PERENNIAL SPECIES OF GERANIUM OF THE UNITED STATES AND CANADA[1]

G. Neville Jones and Florence Freeman Jones

This paper is a taxonomic revision of the perennial larger-flowered species of *Geranium* occurring spontaneously in North America north of Mexico. Although it would be better to include the numerous Mexican species, the complexity of the taxonomic problems connected with a study of the plants from the region south of the Rio Grande would have necessitated additional time and facilities at present unavailable. We therefore somewhat reluctantly postpone continuation of this work until some future time.[2]

The first general study of the North American species of *Geranium* was published by Torrey & Gray in the first volume of their *Flora of North America* in 1838. Their treatment included three species, *G. maculatum*, *G. albiflorum*, and *G. erianthum*. In 1849, George Engelmann wrote a brief synopsis including seven species. During the first twelve years of the twentieth century two comprehensive systematic studies of *Geranium* were published, the first in 1907 by Hanks & Small in the *North American Flora*, including only the North American species; another study, by R. Knuth, in Engler's *Das Pflanzenreich*, in 1912, is a monograph world-wide in its scope. However, Knuth's treatment of the North American species appears to have been in large part a transcription of the earlier work of Hanks & Small. We have not overlooked the treatment of the Geraniaceae in *Memoirs of the Boston Society of Natural History*, prepared by W. Trelease and published in 1888, a condensation of which appeared in Gray's *Synoptical Flora* in 1897. While possibly of importance at the time of their publication, these treatments are now regarded as of principally historic value, the subject, as noted above, having been more adequately elucidated several years later.

The North American perennial larger flowered species of

[1] Completed with the aid of a grant from the Graduate School of the University of Illinois.

[2] The Mexican species will soon be discussed by Dr. Emery Moore of the Gray Herbarium.

Geranium belong to the sections *Caespitosa* R. Knuth, and *Sylvatica* R. Knuth. Two Mexican species, *G. lentum* and *G. Wislizeni*, whose ranges extend northward into the United States, belong to the section *Mexicana* R. Knuth. In the present paper eighteen species are recognized as occurring in the United States and Canada. One of these, *G. pratense*, is adventive from Europe; one other species, *G. erianthum*, although indigenous on the northwest coast of North America, occurs also in eastern Asia. The remaining species are endemic to North America. They attain their greatest taxonomic development in the western part of the continent, especially in the Rocky Mountain region and in California. Only one species, *G. maculatum*, is confined to the eastern half of the continent.

As is well known, the gynoecium of *Geranium* consists of five carpels cohering into a 5-lobed, 5-loculed ovary. The carpels are arranged around an elongated torus forming a stylar column (the style), often referred to as the "beak", terminating in five stylodia, each stylodium stigmatiferous near the apex of its inner surface. For these free distal ends of the style (often termed stigmas or stylar branches) the term *stylodium* is used in this paper. Each gynoecium has five stylodia. It is not correct to call them stigmas because only the inner surface of the tip of each is stigmatic; the term beak is likewise undesirable on account of its ambiguity. There are four distinguishable parts: (1) the stylar column proper, (2) the tapering, short upper portion of the style, (3) the free tips of the style (stylodia), and (4) the five separate stigmas.

The principal characters yielding significant taxonomic results are: (1) habit of growth; (2) length of mature stylodia; (3) pubescence of petals; and (4) type of indument, particularly of the pedicels, and to a lesser extent, on stem and leaves. The conclusion has been reached that color of petals, taken alone, is of secondary importance, and useful only when employed in conjunction with fundamental morphological characters. In herbarium specimens that have not been carefully prepared, the color of the petals, whether white, pink, or purple may be sometimes rather difficult to satisfactorily determine. Unlike the annual or biennial species, which, as shown by Fernald,[1] often

[1] RHODORA, xxxvii. 295. 1935.

manifest seed characters of outstanding taxonomic value, the seeds of the perennial larger flowered species, contrary to our expectations, have proved to be altogether too uniform for taxonomic purposes.

For the opportunity of completing this study we are indebted to Professor M. L. Fernald, Director of the Gray Herbarium, who first suggested this problem several years ago, and under whose genial guidance the work was begun by the junior author; to Miss Ruth D. Sanderson, Librarian of the Gray Herbarium, thanks are due for able bibliographical assistance in the initial stages of the work. For the loan of specimens in the herbaria under their charge we are indebted to Drs. H. L. Mason, University of California (UC); P. C. Standley, Field Museum (F); M. L. Fernald, Gray Herbarium (G); H. A. Gleason, New York Botanical Garden (NY); and W. R. Maxon, United States National Herbarium (US). Specimens in the Herbarium of the University of Illinois (UI) likewise have been examined. The herbaria containing the specimens cited in this paper are indicated in the usual way by the abbreviations included in the above parentheses (NE = New England Botanical Club).

Taxonomy

Geranium [Tourn.] L.—Perennial to annual herbs; leaves alternate or opposite, stipulate, usually orbicular to reniform, variously palmately lobed or dissected; flowers actinomorphous, on axillary peduncles; sepals 5, imbricate, persistent; petals 5, imbricate, separate, hypogynous, deciduous, alternating with 5 glands; stamens 10 (rarely only 5), hypogynous, usually all antheriferous, five of them longer and alternating with the shorter ones; filaments distinct or only slightly united at the base; ovary 5-carpellate, deeply 5-lobed; styles glabrous within, elastically recoiling at maturity, permanently attached to the carpel-bodies; carpels 2-ovuled, becoming 1-seeded; seeds with folded cotyledons and little or no endosperm.—Sp. Pl. 676 (1753); Bigelow, Fl. Bost. ed. 2, 161 (1824); Elliott, Sketch, ii. 156 (1824); DC. Prodr. i. 639 (1824); Hooker, Fl. Bor.-Am. i. 115 (1830); Torr. & Gray, Fl. N. Am. i. 206 (1838); Gray, Genera Illustr. ii. 127. *t. 150* (1848); Engelm. in Gray, Pl. Fendler. [Mem. Am. Acad. n. s. iv.] 25 (1849); Benth. & Hook. Gen. Pl. i. 272 (1862); Brewer & Watson, Bot. Calif. i. 93 (1880); Trelease in Mem. Bost. Soc. Nat. Hist. iv. 72 (1888), and in Gray, Syn. Fl. i. 358 (1897); Howell, Fl. Nw. Am. 105 (1897); Chapman, Fl. So. U. S. ed. 3, 66 (1897); Small, Fl. Se. U. S. 659 (1903); Hanks & Small

in N. Am. Fl. xxv. 3 (1907); Britton, Manual, ed. 3, 573 (1907); Robinson & Fernald in Gray, Man. Bot. ed. 7, 534 (1908); Coulter & Nelson, New Man. Rocky Mt. Bot. 302 (1909); Knuth in Engler, Pflanzenr. iv. (129) 43 (1912); Britton in Britton & Brown, Illustr. Fl. N. U. S. ed. 2, ii. 426 (1913); Piper & Beattie, Fl. Se. Wash. & Adj. Ida. 154 (1914), Fl. Nw. Coast 154 (1915); Henry, Fl. So. Brit. Columbia, 198 (1915); Wooton & Standley, Contr. U. S. Nat. Herb. xix. 380 (1915); Rydberg, Fl. Rocky Mts., 530 (1917); Bailey, Man. Cult. Pl. 433 (1924); Jepson, Man. Fl. Pl. Calif. 589 (1925); Rydberg, Fl. Prairies & Plains, 499 (1932); Small, Man. Se. Fl. 744 (1933); Munz, Man. So. Calif. Bot. 273 (1935); Jepson, Fl. Calif. ii. 403 (1936); St. John, Fl. Se. Wash. & Adj. Ida. 241 (1937); Peck, Man. Higher Pl. Oregon, 461 (1941).

TYPE SPECIES: *Geranium sylvaticum* L.

SYNOPSIS OF THE SECTIONS

Section I. SYLVATICA R. Knuth in Engler, Pflanzenr. iv (129) 107 (1912).—Caudex usually simple; plants erect, usually single-stemmed, scarcely tufted; basal leaves usually large (8–20 cm. broad); flowers large, the petals 1–2 cm. long.—*G. maculatum, pratense, oreganum, erianthum, viscosissimum, strigosius, Richardsonii, californicum, concinnum, attenuilobum.*

Section II. CAESPITOSA R. Knuth, op. cit. 99.—Caudex branched; plants cespitose, the stems often becoming more or less decumbent; leaves small, usually 2–7 cm. broad; flowers large, the petals 1–2 cm. long.—*G. marginale, Cowenii, Parryi, Fremontii, eremophilum, caespitosum.*

Section III. MEXICANA R. Knuth, op. cit. 196.—Caudex simple or branched; plants ascending or erect; leaves small; flowers small, the petals scarcely 1 cm. in length.—*G. lentum, Wislizeni.*

ANALYTICAL KEY TO THE SPECIES

a. Petals glabrous except at the ciliate base, 1–2 cm. long, purple (rarely white); stylodia short, 1–2.5 mm. in length; fruiting pedicels erect, not bent upward; caudex usually simple, the plants erect, usually single-stemmed, scarcely tufted; divisions of the leaves rhombic in outline, the terminal tooth usually much longer than the others. . . . b.

b. Pedicels and stylar column short-pubescent, not glandular; stylodia one-third to one-half the length of the tapering upper portion (beak) of the stylar column, the latter 3.5–4 cm. long at maturity; filaments sparsely ciliate at base; petioles of the basal leaves and the lower internode of the stem pilose, not glandular. . . . . 1. *G. maculatum.*

b. Pedicels densely glandular-villosulous. . . . c.

c. Filaments sparsely ciliolate at base with trichomes less than 0.5 mm. long; stylodia one-third to one-half the length of the tapering upper portion (beak) of the stylar column. . . . d.

d. Mature stylar column 2.5–3 cm. long, the beak 8–10 mm. long; native of Eurasia, adventive in eastern North America.....2. *G. pratense.*
d. Mature stylar column 3–5 cm. long, the beak 5–7 mm. long; native, western North America from Washington to California west of the Cascade Mountains..3. *G. oreganum.*
c. Filaments conspicuously pilose with trichomes 1–3 mm. long; stylodia one-sixth to one-fourth the length of the tapering upper portion (beak) of the stylar column, the latter 2–3 cm. long at maturity; Alaska and British Columbia; Siberia.....4. *G. erianthum.*
a. Petals pilose on the inner surface one-fourth to one-half their length; stylodia 3–9 mm. long (except *G. Wislizeni*); fruiting pedicels spreading or reflexed and ultimately bent upward....e.
e. Petals pilose inside not more than one-fourth their length....f.
f. Plants usually single-stemmed, erect, the caudex simple; divisions of the leaves rhombic in outline, the terminal tooth usually much longer than the others; stylodia 4–8 mm. long; petals purple to pale lavender, rarely white; inflorescence rather compact, several–many-flowered....g.
g. Petioles of the basal leaves and the lower internode of the stem rather copiously glandular-villous or pilose, and usually with an underlying pubescence of numerous short glandular trichomes.....5. *G. viscosissimum.*
g. Petioles of the basal leaves and the lower internode of the stem strigillose or strigose to rather densely retrorsely pubescent with whitish non-glandular trichomes, less commonly nearly glabrous, not viscid.....6. *G. strigosius.*
f. Plants more or less cespitose, the stems erect, or often decumbent, the caudex usually branched; petals lavender; inflorescence somewhat loosely cymose....h.
h. Pedicels glandless....i.
i. Petals narrowly obovate or oblanceolate; stylodia 3–4 mm. long.....11. *G. marginale.*
i. Petals obcordate or broadly obovate; stylodia 5–7 mm. long.....12. *G. Cowenii.*
h. Pedicels glandular....j.
j. Petioles of the basal leaves and the lower internode of the stem glandular-pubescent.....13. *G. Parryi.*
j. Petioles of the basal leaves and the lower internode of the stem finely retrorsely pubescent to nearly glabrous, not glandular.....14. *G. Fremontii.*
e. Petals pilose on the inner surface one-third to one-half their length....k.
k. Petals 1–2 cm. long, or if slightly shorter, not white....l.
l. Leaf-lobes abruptly attenuate, the caudate tips 4–6 mm. long; stylodia 5 mm. long; pedicels rather densely short-glandular with yellowish trichomes; northern California.....10. *G. attenuilobum.*
l. Leaf-lobes acute to acuminate, or obtusish, not caudate-attenuate....m.
m. Pedicels glandular (rarely glandless in *G. eremophilum*); stylar column more or less glandular....n.
n. Stylodia 3–4 mm. long; petals white or purple-tinged; pedicels usually copiously glandular-villosulous, the trichomes with usually purplish

glands; anthers 1–2 mm. long; filaments 6–9 mm. long.....7. *G. Richardsonii.*
n. Stylodia 4.5–9 mm. long; petals pink or lavender....o.
o. Stems erect, more or less tufted but not profusely branched, the first internode 10–40 cm. long; leaf-lobes usually deeply and sharply incised, the segments lanceolate, acuminate or acute; anthers 2–3 mm. long; California....p.
p. Stylodia 4.5–5.5 mm. long; pedicels rather densely short-glandular; stem and petioles nearly glabrous to finely retrorsely pubescent, sometimes glandular, not villous..8. *G. concinnum.*
p. Stylodia 6–9 mm. long; pedicels glandular-villosulous and often with longer glandless trichomes; stems and petioles villous..9. *G. californicum.*
o. Stems erect or decumbent, cespitose, profusely branched, the first internode 1–8 cm. long; anthers 1–2 mm. long; leaf-lobes usually not sharply incised, the segments oval and acute to obtuse; New Mexico, Arizona.....15. *G. eremophilum.*
m. Plants completely eglandular, the pedicels retrorsely short-pubescent....q.
q. Petals deep rose-purple; stylodia 5–8 mm. long; stems erect or decumbent, profusely branching 16. *G. caespitosum.*
q. Petals white or purple-tinged; stylodia 3–4 mm. long; stem erect, not profusely branching..7. *G. Richardsonii.*
k. Petals 7–9 mm. long, white or pinkish; plants of Mexico, extending northward into New Mexico and Arizona....r.
r. Stems, petioles, and pedicels copiously glandular-villosulous; mature stylar column 2–2.5 cm. long, glandular-pubescent; stylodia 4–5 mm. long.....17. *G. lentum.*
r. Stems and petioles sparsely pilose, not glandular; mature stylar column 1.4–1.8 cm. long, puberulent; stylodia 2–3 mm. long.....18. *G. Wislizeni.*

1. G. MACULATUM L. Perennial with simple caudex; stem solitary, erect, 20–50 cm. tall, varying from glabrous to puberulent, or pubescent with spreading or retrorse trichomes; petioles of the basal leaves 7–20 cm. long, glabrous to strigose, the blades 3–10 cm. broad, roundish in outline, reniform to pentagonal, strigillose, incisely 5-parted, the divisions cuneate, 1–3-lobed, usually rhombic in outline, lobed and cut, acute to acuminate; basal sinus acute to truncate; stipules attenuate-lanceolate, 5–10 mm. long, pubescent; cauline leaves similar, 5–20 cm. broad, 3–7-parted; peduncles 1–5, umbellately arranged, 1–12 cm. long, retrorsely pubescent or hispidulous; pedicels retrorsely short-pubescent, 0.5–5 cm. long, paired, erect in fruit; sepals 7–9 mm. long, oval-lanceolate, minutely pubescent, the outer villous, the inner ciliate, sometimes the long hairs gland-tipped; mucro 2–3 mm. long; petals 1–1.5 cm. long, obovate, entire, or sometimes slightly emarginate, rose-purple or occasionally white, glabrous except at the ciliate base; filaments sparsely ciliolate at the base;

mature stylar column 3.5–4 cm. long, puberulent or sometimes sparsely pilose, the beak about one-fourth to one-third of its total length; stylodia 2 mm. long; carpel-bodies 4–5 mm. long, sparsely hispid with an underlying puberulence; seeds 3–3.5 mm. long, reticulate.—L. Sp. Pl. 681 (1753), ex p.; Michx. Fl. Bor.-Am. ii. 38 (1803); Pursh, Fl. Am. Sept. ii. 448 (1814); Bigelow, Fl. Bost. ed. 2. 256 (1824); Elliott, Sketch Bot. S. C. & Ga. ii. 157 (1824); Raf. Med. Bot. i. 215. *t. 42* (1828); Hook. Fl. Bor. Am. i. 116 (1830), excl. var. β; Gray, Gen. N. Am. Pl. ii. *t. 150* (1849); Macoun, Cat. Can. Pl. i. 90 (1883); Trelease in Mem. Boston Soc. Nat. Hist. iv. 74 (1888), in Gray, Syn. Fl. N. Am. i. 358 (1897); Chapman, Fl. So. U. S. ed. 3. 66 (1897); Small, Fl. Se. U. S. 660 (1903); Hanks & Small in N. Am. Fl. xxv. 12 (1907); Britton, Man. ed. 3. 573 (1907); Robinson & Fernald in Gray, Man. Bot. ed. 7. 535 (1908); Knuth in Engler, Pflanzenr. iv. (129). 113 (1912); Britton in Britton & Brown, Illustr. Fl. N. U. S. ed. 2, ii. 427, *fig. 2653* (1913); Rydberg, Fl. Prairies & Plains, 501 (1932); Small, Man. Se. Fl. 744 (1933); Deam, Fl. Indiana, 624 (1940). *Geranium maculatum* var. *albiflorum* Raf. Med. Bot. i. 217 (1828), *nomen nudum; Geranium maculatum* var. *album* Lauman, in Bailey, Cyclop. Am. Hort. 640 (1900). *Geranium maculatum* var. *plenum* Lauman, l. c. *Geranium maculatum* f. *albiflorum* House, Bull. N. Y. State Mus. ccliv. 243 (1924).—In fields, meadows, and open woods, Quebec to Georgia, westward to Kansas and Manitoba. Type Locality: "*Habitat in* Carolina, Virginia, Sibiria." Representative specimens: Quebec: Isle Perrot, Deux-Montagnes County, *P. Louis-Marie* 5 (G). Maine: Woolwich, Sagadahoc County, *Fernald & Long* 13982 (NE); Orono, *M. L. Fernald*, June 27, 1890 (NE); Falmouth, *E. B. Chamberlain* 393 (NE); Bangor, *O. W. Knight* 1820 (G); North Berwick, *J. C. Parlin*, May 1892 (G). New Hampshire: Derry, *C. F. Batchelder*, May 29, 1913 (UC). Vermont: Snake Mt., Weybridge, *W. W. Eggleston*, June 30, 1892 (NY). Massachusetts: Martha's Vineyard, *F. C. Seymour* 1469 (NY); Wellesley, *Sarah H. Harlow*, May 22, 1889 (NY); Deerfield, Franklin Co., *E. T. & N. Moldenke* 9634 (NY, UI); Amherst, *S. C. Brooks*, June 1907 (UC); Arlington, *A. H. Moore* 2714 (UC); Concord, *S. C. Brooks* 1176 (UC). Rhode Island: Block Island, *R. K. Beattie* 4823 (UI). Connecticut: Southington, *C. H. Bissell* 341 (NY); Waterbury, *C. G. DuBoise*, May 1883 (UC); Berlin, *M. Brandegee* (UC); Norwich, *W. A. Setchell*, May 1883 (UC). New York: Apalachin, *F. E. Fenno* 75 (NY); Staten Island, *N. L. Britton*, May 17, 1891 (NY); West Point, *E. A. Mearns*, June 3, 1883 (NY); Genesee Co., *J. H. White* 69 (UC); Enfield Gorge, *Muenscher & Bechtel* 252 (UC); Henderson's Quarry, *B. Maguire* 6443 (UC); Albany, *H. D. House* 6066 (UC). New Jersey: Oradell, *N. L. Britton*, Oct. 18, 1891 (NY); Clifton,

G. V. Nash 834 (NY); New Brunswick, *F. H. Blodgett*, May 1894 (NY); West Collingswood, Camden Co., *J. W. Adams* 189 (UC). PENNSYLVANIA: Power's Run, Allegheny Co., *O. E. Jennings*, May 25, 1904 (UC); New Bloomfield, Perry Co., *J. W. & M. T. Adams* 2107 (UC); Newton Square, Delaware Co., *J. W. Adams* 1307 (UC); Wawa, Delaware Co., *F. W. Pennell* 14496 (NY); Selinsgrove, Snyder Co., *H. N. Moldenke* 2345 (NY); Lancaster, *J. K. Small*, May 1892 (NY, F). MARYLAND: West Chevy Chase, *Agnes Chase* 2808 (UI). DISTRICT OF COLUMBIA: Fort Totten, *Th. Holm* 281 (UI); Terra Cotta, *Th. Holm*, May 2, 1913 (UI). VIRGINIA: Antioch, Prince William Co., *H. A. Allard* 295 (G, NY); Arlington, *F. Blanchard*, April 19, 1891 (NY), *L. Kelso* 1122 (UC); Williamsburg, *E. J. Grimes* 2643 (NY). NORTH CAROLINA: Lake Junaluska, Haywood Co., *A. L. Price* 182 (NY); Flat Rock, *Mrs. J. Shoolbred* in 1857 (NY); Tar River, Granville Co., *D. S. Correll* 486 (G). SOUTH CAROLINA: Anderson Co., *L. R. Gibbes* in 1885 (NY), Anderson, *John Davis* 1695 (UI); Charleston, *L. R. Gibbes* in 1859 (NY). GEORGIA: Tennille, Washington Co., *R. M. Harper* 2112 (NY); without definite locality, *Chapman* (NY); Stone Mountain, DeKalb Co., *J. K. Small*, May 1895 (NY, F). ONTARIO: Leamington, *John Macoun* 34110 (NY); Kingston, *J. Fowler*, June 5, 1902 (G, NY); Belleville, *John Macoun* 328 (G). MICHIGAN: Haslet, *T. G. Yuncker* 224 (UI); Lansing, *T. G. Yuncker* 171 (UI); Ann Arbor, *C. D. LaRue*, May 30, 1915 (UI). WISCONSIN: Benderville, Brown Co., *H. J. Schuette*, June 9, 1901 (NY); Milwaukee, *H. E. Hasse* (NY); Blue Mounds, Iowa Co., *Clikeman, Drescher, Griswold & Liederman*, May 16, 1932 (UC). MINNESOTA: Prospect Park, *E. P. Sheldon*, May 1895 (NY, UC); Thompson, *J. H. Sandberg* 123 (NY); Bald Eagle, Ramsey Co., *S. F. Blake* 184 (UI). IOWA: Ames, *C. R. Ball*, May 24, 1897 (NY); Floris, *Ada Hayden* 9614 (NY); Cedar Heights, *Myrel Burk* 242 (UI); Davenport, *E. A. Ross*, May 16, 1891 (UC); Fayette Co., *B. Fink* 89 (UC). ILLINOIS: Peoria, *F. E. McDonald*, June 1903 (NY); Carthage, Hancock Co., *F. C. Gates* 10225 (UI); Paxton, *Martha Anderson*, May 25, 1891 (NY); Vermilion River between Oakwood and Collison, Vermilion Co., *G. Neville Jones* 11272, 11332, 13441, 13575 (UI). INDIANA: Clark Co., *C. C. Deam* 27644 (NY); Fort Harrison, Marion Co., *R. C. Friesner* 9597 (NY, UI, UC); Miller, *Agnes Chase* 1525 (UI); Granville, *D. D. Condit* in 1903 (UC); OHIO: Shawnee State Forest, *D. Demaree* 10618 (NY, UC); Berea, *J. R. Watson*, May 1897 (UI). WEST VIRGINIA: Bluefield, *C. F. Millspaugh* 1459 (NY); Ohio Co., *John Pattison*, May 3, 1936 (NY); Ralston Run, Randolph Co., *E. L. Core* 2683 (NY). KENTUCKY: Union Co., *H. T. Shacklette* 289 (NY); without definite locality, *C. W. Short* in 1840 (NY). MISSOURI: Courtney, *B. F. Bush* 7928 (NY, UI); Creve Coeur Lake, St.

Louis, *William Palmer* 1275 (NY); Barracks, *Clara Fuhr*, May 2, 1917 (UI); Forestell, St. Charles Co., *John Davis*, May 25, 1917 (UC). TENNESSEE: Knox Co., *A. Ruth* 2414 (NY); Decatur Co., *G. L. Ames*, May, 1855 (UI); Knoxville, *A. Ruth*, April 5, 1900 (UI). ARKANSAS: Nogo, Pope Co., *G. M. Merrill* 129, 172 (UI). MISSISSIPPI: Grenada, *Vera Millsaps*, May 20, 1932 (UI). ALABAMA: Monte Sano, *C. F. Baker*, May 23, 1897 (NY); Auburn, Lee Co., *Earle & Underwood*, April 25, 1896 (NY). KANSAS: Wyandotte Co., *A. S. Hitchcock* 1138 (NY). NEBRASKA: Long Pine, *J. M. Bates* 1071 (NY).

Geranium maculatum, the common species of eastern North America, is similar to the European *G. pratense*, which is occasionally adventive in northeastern United States. It differs notably in having non-glandular indument.

Linnaeus, in giving the geographical range of this plant, said "*Habitat in* Carolina, Virginia, Sibiria". We now suspect the Siberian plant to be *G. erianthum*, described by DeCandolle, a species which also grows in Alaska, and is closely allied to *G. maculatum* and *G. oreganum*. These four species form a distinct group, separate from the other large-flowered North American species, which are characterized by longer stylodia, abundantly pilose petals, and the reflexed and upwardly bent fruiting pedicels. In *G. maculatum* the stylodia are 1–2 mm. long, the petals ciliate at the base, and the fruiting pedicels erect.

In his *Florula Bostoniensis* (1824), Bigelow comments on *Geranium maculatum* as follows: "As the leaves grow old, they are usually marked with pale spots about the sinuses." This characteristic, also noted by Rafinesque, but apparently not very conspicuous on most specimens, may account for the specific epithet. In fact Rafinesque says "the specific name applies to the root and leaves which are often spotted or mottled; but a variety is spotless."

2. G. PRATENSE L. Perennial with simple caudex; stem 20–60 cm. tall, solitary, erect, retrorsely strigillose on the lower internode; petioles of the basal leaves 10–20 cm. long, retrorsely pubescent; the blades 5–10 cm. broad, orbicular to pentagonal in outline, short-strigose on the upper surface and along the veins on the lower surface, deeply 5–7-parted, the lobes deeply incised, with narrow, acute segments; stipules attenuate-lanceolate, 3–20 mm. long; basal sinus rounded or obtuse; cauline leaves similar, smaller and nearly sessile; inflorescence spreading-cymose, terminal; peduncles 2–8 cm. long, these, as well as the pedicels

and calyces densely glandular-villosulous; pedicels 0.5–2.5 cm. long, paired, erect at maturity; sepals 9–13 mm. long, oval, the mucro 1–2 mm. long; petals 12–20 mm. long, entire or slightly retuse at apex, blue-purple, glabrous except at the very base; filaments ciliolate at the base; mature stylar column 2.5–3 cm. long, densely short-pubescent; stylodia 2–2.5 mm. long; carpel-bodies 4–4.5 mm. long, copiously pilose; seeds slightly reticulate. —Sp. Pl. 681 (1753); Macoun, Cat. Can. Pl. i. 90 (1883); Trelease in Mem. Boston Soc. Nat. Hist. iv. 75 (1888); Hanks & Small in N. Am. Fl. xxv. 13 (1907); Britton, Manual, ed. 3. 573 (1907); Robinson & Fernald in Gray, New Man. Bot. ed. 7. 535 (1908); Knuth in Engler, Pflanzenr. iv. (129). 127 (1912); Britton in Britton & Brown, Illustr. Fl. N. U. S. ed. 2, ii. 420, *fig. 2652* (1913); Bailey, Man. Cult. Pl. 434 (1924).—Native of temperate Eurasia; introduced into North America, and adventive in fields and meadows in northeastern United States and adjacent Canada and Newfoundland; known to occur in Newfoundland, Quebec, Nova Scotia, New Brunswick, Maine, Massachusetts, New York. TYPE LOCALITY: northern Europe. Representative specimens: NEWFOUNDLAND: Ferryland, *Betty Watt Brooks*, July 20, 1937 (G); Barred Islands to Fogo Island, *J. D. Sornborger*, Aug. 17, 1903 (G); near Curling, Humber Arm, Bay of Islands, *Fernald & Long* 1848 (G). QUEBEC: bord des chemins le long de la rivière Dartmouth, Baie de Gaspé, *F. Marie-Victorin* et al. 17325 (G); New Carlisle, Bonaventure County, *Williams & Fernald*, July 27, 1902 (G); Montreal-Ouest, *Marie-Victorin* et al. 45648 (F). NOVA SCOTIA: Bridgewater, *John Macoun* 81525 (F); Yarmouth, *Bissell & Graves* 21738, 21739 (G); Springville, Pictou County, *H. St. John* 1431 (G). NEW BRUNSWICK: St. Andrew's, *J. Fowler*, June 25, 1900 (G). MAINE: Staceyville, Penobscot County, *Fernald*, July 5, 1900 (G). MASSACHUSETTS: Swampscott, *L. A. Wentworth*, June 26, 1903 (G).

This introduced species resembles the native eastern North American *G. maculatum*, but may be distinguished by the dense glandular indument on the upper part of the plant, especially on the pedicels. The basal leaf-blades are 5–7-(usually 7-) parted with the divisions cleft into numerous lobes, and the petals are deep purple. *G. maculatum* has the leaf-blades usually 5-parted, the divisions lobed or toothed to a lesser extent, and the petals are paler purple.

3. G. OREGANUM Howell. Perennial with simple caudex; stem solitary, erect, 40–80 cm. tall, glabrous to pilose and more or less glandular; petioles of the basal leaves glabrous to retrorsely pubescent, 15–40 cm. long; blades 10–12 cm. broad, orbicular to pentagonal in outline, sparsely appressed-pubescent, especially

on the veins, deeply 5–7-lobed, the lobes cuneate and irregularly toothed; basal sinus acuminate; cauline leaves similar, appressed-pubescent, the blades 3–5-cleft; stipules triangular-lanceolate, 5–10 mm. long, chartaceous when dry, puberulent, abundantly ciliate; inflorescence cymose, terminal; peduncles 1–15 cm. long, these as well as the pedicels and calyces glandular-villosulous with purple-tipped trichomes; pedicels paired, 1–3 cm. long, erect in fruit; sepals oval, 7–11 mm. long, with a mucro 2–3 mm. long; petals obovate, deep rose-purple, glabrous except at the ciliate base; filaments ciliate at the base; mature stylar column 3–5 cm. long, densely glandular-pubescent, the beak 5–7 mm. long; stylodia 2 mm. long; carpel-bodies 6–8 mm. long, hispidulous to glandular-pubescent, especially so at the base and along the keel where the trichomes are 1–1.5 mm. long; seeds 3–3.5 mm. long, reticulate.—Fl. Nw. Am. 106 (1897); Piper & Beattie, Fl. Nw. Coast, 228 (1915). *Geranium maculatum* β Hooker, Fl. Bor.-Am. i. 116 (1830). *Geranium albiflorum* β *incisum* Torr. & Gray, Fl. N. Am. i. 206 (1838). *Geranium incisum* Nutt. ex Torr. & Gray, l. c., pro syn. *G. albiflorum* β? *incisum*. Non Andrews, Bot. Rep. i. *t. 67* (1797). *Geranium incisum* sensu Brewer & Watson, Bot. Calif. i. 94 (1880); Trelease, Mem. Boston Soc. Nat. Hist. iv. 74 (1888) ex. p.; M. E. Peck, Man. Higher Pl. Oregon 461 (1941). Non Nutt. ex Torr. & Gray 1838.—Woods, thickets, and meadows, southern Washington to northern California, west of the Cascade Mountains.—Type Locality: "Edge of woods and open places throughout the Willamette valley," [Oregon]. Collected by Thomas Howell. Representative specimens: Washington: Clark Co., *G. Neville Jones* in 1936 (UI). Oregon: Farmington, *Kirkwood* 183 (NY); Forest Grove, Washington Co., *F. E. Lloyd*, June 5, 1893 (NY); without definite locality, *Elihu Hall* 73 (NY, F, G); Wimer, Jackson Co., *E. W. Hammond* 63A (NY, UC); Prospect, Jackson Co., *J. William Thompson* 13087 (NY); Camp Baker, Jackson Co., *Hitchcock & Martin* 5051 (NY); Eugene, Lane Co., *L. Constance* 941 (NY, F, UC, G); without definite locality, *Thomas J. Howell*, June 1880 (NY); Ashland, *E. I. Applegate* 60 (G); Salem, *J. C. Nelson* 1330 (G); "Oregon: *Douglas*" (G); Corvallis, *A. Isabel Mulford*, May 31, 1892 (G), *M. Stason* 2468 (UC); Oswego, *Drake & Dickson*, May 1889 (F); Calapooya Valley, Douglas Co., *M. A. Barber* 132 (G); Fort Klamath, *Coville & Applegate* 303 (F); Estacada, *M. W. Lyon* 112 (F); Beaverton, *Sisters of St. Mary*, May 15, 1916 (UC). California: Strawberry Valley, Siskiyou Co., *H. Edwards*, Aug. 1875 (NY); Siskiyou Mountains, *T. S. Brandegee*, July 1887 (UC); Siskiyou Co., *L. E. Smith* 388, 712 (G); Blocksburg, Humboldt Co., *J. W. Blankinship*, June 22, 1893 (G).

The identity of "*G. albiflorum* β*? incisum*" Torr. & Gray with

G. oreganum Howell is established by the statements of Torrey & Gray that their plant was collected by Thomas Nuttall in Oregon, and that "the petals have a lateral tuft of hairs at the base". It was thus effectively separated from *G. Richardsonii* and other Rocky Mountain species by the disparate geographical range, and the character of the ciliation of the petals. *G. erianthum* is the only other western American species which has this petal character. Any doubt as to the identity of the Nuttall collection from Oregon is immediately dispelled by an examination of a specimen in the Torrey Herbarium (NY) with Nuttall's label bearing the inscription "*Geranium* * *incisum*". This plant is unmistakably *G. oreganum* Howell. Because of an earlier use of the name *G. incisum* by Andrews in 1797 for a South African species, Howell's name instead of Nuttall's, must be used for this plant. Incidentally, the statement by Torrey & Gray (l. c.) that they had "the same plant [i. e., *G. oreganum* Howell] from Altaic Siberia, sent by Prof. Fischer" indicates that they had in all probability confused it with *G. erianthum* DC., which does grow in Siberia.

The *Geranium maculatum* "β. North-West America. *Douglas.*—Flowers large, handsome, purple." of Hooker's Fl. Bor.-Am. i. 116 (1830) is undoubtedly *G. oreganum* Howell, as shown by a specimen in the Gray Herbarium marked in Dr. Gray's handwriting "Oregon, Douglas, *Hooker*", later inscribed by C. V. Piper " = *G. oreganum* Howell." David Douglas, in his Journal[1] (p. 127), records that he discovered this plant on May 2, 1825, on Menzies Island in the Columbia River, "opposite the Hudson Bay Company's establishment at Point Vancouver," as follows: "(172) *Geranium* sp., perennial; flowers purple; dry meadows; plentiful." There is no doubt that Douglas was describing *G. oreganum*, since this is the only perennial large-flowered species of Geranium occurring in that region.

Geranium oreganum Howell and *G. strigosius* St. John, occupy contiguous geographical areas, and possibly on this account they have been frequently misinterpreted, although they are not particularly closely related. *Geranium oreganum* grows only west of the Cascade Mountains; the trichomes of the erect

[1] Journal kept by David Douglas 1823–1827. Royal Horticultural Society, London, 1914.

fruiting pedicels are tipped with purple glands; the mature stylodia are about 2 mm. long; and the petals are glabrous, or sparsely pubescent only at the base. *Geranium strigosius* grows only east of the Cascade Mountains; its yellowish- or tawny-glandular pedicels are reflexed and bent upward in fruit; the mature stylodia are 4–5 mm. long; the petals are pilose about one-fourth their length; and the leaf-lobes are sharply incised. *Geranium oreganum* is closely related to the eastern North American *G. maculatum*, and to *G. erianthum*, while *G. strigosius* shows evidence of close affinity with the Rocky Mountain species, *G. viscosissimum* and *G. Richardsonii*.

Since *Geranium oreganum* is known to occur only west of the Cascade Mountains, the data accompanying an undoubted specimen of this species, *Henderson* 158 (UC), "Blue Mts., Oregon", are almost certainly an error, caused in all probability by a mixture of labels.

4. G. ERIANTHUM DC. Perennial with simple caudex; stem solitary, erect, 20–60 cm. tall, retrorsely appressed-puberulent or strigillose, or sometimes nearly glabrous below; petioles of the basal leaves 10–30 cm. long; blades 5–10 cm. broad, reniform to pentagonal, deeply 5–7-parted, the lobes rhombic to oval, cleft into three main divisions which are again several times divided; upper surface strigose, the lower surface paler green, strigose or pilosulous along the veins; basal sinus obtuse to truncate; cauline leaves similar, smaller, 2–8 cm. broad, 3–5-parted; stipules triangular-lanceolate, 5–15 mm. long, glabrous, or puberulent at base; inflorescence subcapitate, the short peduncles 0.5–5 cm. long; pedicels 1–several, 0.5–1 cm. long, erect in fruit, glandular-villous with trichomes 1–3 mm. long, and often densely canescent-pilose; sepals 8–10 mm. long, oval, strigillose and often copiously pilose or villous on veins and margins; mucro 1.5–3 mm. long; petals 1.5–2 cm. long, obovate, entire, rose-purple with darker veins, ciliate near base; filaments pilose for about one-third their length, the trichomes 1–3 mm. long; mature stylar column 2–3 cm. long, hispidulous, the stylodia one-sixth to one-fourth the total length of the tapering upper portion (beak) of the stylar column; stylodia 1–2 mm. long; carpel-bodies about 4 mm. long, puberulent, and sparsely hispid, the trichomes 1–3 mm. long with longer glandular pilosity along the keel toward the apex; seeds about 3 mm. long, reticulate.—DC. Prodr. i. 641 (1824); Bongard in Mém. Acad. Sci. St. Pétersb. sér. 6, ii. 129 (1833); Torr. & Gray, Fl. N. Am. i. 206 (1838); Ledeb. Fl. Ross. i. 464 (1842); Macoun, Cat. Can. Pl. i. 90 (1883); Trelease in Mem. Boston Soc. Nat.

Hist. iv. 74 (1888), in Gray, Syn. Fl. i. 358 (1897); Hanks & Small in N. Am. Fl. xxv. 13 (1907); Knuth in Engler, Pflanzenr. iv. (129) 122 (1912); Henry, Fl. So. Brit. Columbia, 198 (1915); Tatew. & Kobay. Contrib. Fl. Aleutian Isl. 60 (1934); Hultén, Fl. Aleutian Isl. 237 (1937).—Abundant on grassy slopes and in valleys, chiefly near the coast, Alaska and British Columbia; Siberia.—TYPE LOCALITY: "in Kamtschatka et Amer. bor. et occidentali. Nelson." Representative specimens: ALASKA: Akutan, *J. M. Macoun* 89604 (NY, US), *I. L. Norberg* 364 (NY); Atka, *W. J. Eyerdam* 1061 (NY); Squaw Harbor, *G. Neville Jones* 8861 (UI); Kings Cove, Alaska Peninsula, *A. Wetmore* 133 (US); Katmai Region, *A. E. Miller*, June 29, 1919 (US); Unimak Island, *W. J. Eyerdam* 2203 (NY); Middleton Island, *E. P. Walker*, June 26, 1922 (NY); Kuiu Island, *Mr. & Mrs. E. P. Walker* 769 (NY, UC, F, US); Fox Bay, *D. Martel* 137 (NY); Shumagin Island, *M. W. Harrington* in 1871–72 (NY); St. Paul Island, *E. C. Johnston*, Aug. 13, 1922 (G), *J. M. Macoun* 89603 (NY, US), *G. Haley*, July 1925 (UC, F); Chignik Bay, *I. L. Norberg* 2 (NY), *C. Flock*, July 2, 1934 (UC); Iliuliuk, *W. L. Jepson* 4, 261a (US); Unalaska, *J. M. Macoun*, July 4, 1896 (NY), *G. Neville Jones* 8955 (UI); Lake Iliamna, *M. W. Gorman* 64 (NY); Hinchinbrook Island, *W. J. Eyerdam*, July 25, 1934 (UC, F); Haines, July 1909, *E. W. Scheuber* (US); McKinley National Park, *Ynes Mexia* 2097 (NY, UC, US); Disenchantment Bay, *F. Funston* 100 (NY, F, UC); Chulitna River, *R. L. Shainwald*, Sept. 11, 1903 (NY); Skagway, *J. P. Anderson* 841 (NY); Windham Bay, *J. D. Culbertson* 4945 (NY, US), 4885 (NY, UC, US); Mt. Dewey, *H. C. Cowles* 1278 (UI, F); Port Hobron, *W. J. Eyerdam* 87 (NY); Olga Bay, Kodiak Island, *Ethel H. & H. B. Looff* 628 (NY), *Ruth Mylroie* 108 (NY); Alitak, Kodiak Island, *Ethel H. Looff*, July–Aug. 1936 (UC); Karluk, *W. T. Horne*, June 1901 (NY), September, 1902 (NY), *C. Rutter* 52 (NY); Popoff Island, *Alice King* (UC); Yakobi Island, *J. P. Anderson* 1378 (US); Juneau, *J. P. Anderson* 531 (NY), *Grace E. Cooley*, July 30, 1891 (NY), *Miss E. A. Shumway*, Aug. 3, 1891 (UC), July 26, 1891 (UI); Sitcha [Sitka], *Bongard* (NY); Baranoff Island, *J. P. Anderson* 266 (US). YUKON: White Pass, *Alice Eastwood* 873 (UC, US). BRITISH COLUMBIA: 9-mile Mountain, northeast of Hazelton, *T. T. McCabe* 8160 (UC); Babine, 11 miles south of Takla Lake, *T. T. McCabe* 8023 (UC); Klappan River, *Preble & Mixter* 633 (US); Queen Charlotte Islands, *Franz Boas* 106 (NY); Copper Mt., Prince of Wales Island, *W. F. Newcombe* 187 (F).

Hultén (1937) summarizes the total geographical area of this species as follows: "Asia: from Vilju distr., Gishiginsk, northernmost Kamtchatka (Cape Gavenski) and Commander Islands

southwards to Amgun R., Ussuri and Honshu. Some few reports north of this area from Anadyr and Chukch Penins. America: from St. Paul Isl., the Aleutian Islands, Alaska Penins., Nushagak and eastwards along the coast to middle S. E. Alaska, also reported from St. Michael north of this area (by Turner)". It extends southward to the Queen Charlotte Islands, British Columbia.

By its restricted geographical range, as well as its several distinctive morphological characters, *G. erianthum* is well-defined and not to be confused with any other North American species. It grows in Siberia, Alaska, Yukon, and northern British Columbia, and is a member of that group of species with purple flowers, short stylodia, and petals ciliate at the base, including *G. pratense* (European), *G. maculatum*, and *G. oreganum*. It differs from those species in having long-pilose filaments, and the stylodia one-sixth to one-fourth the length of the beak of the mature stylar column. The other species of this group have the filaments scarcely ciliolate at the base (the trichomes less than 0.5 mm. long), and the stylodia are about one-third the length of the beak of the mature stylar column.

5. G. VISCOSISSIMUM Fisch. & Mey. Perennial with simple caudex; stems solitary or few, erect, usually 60–90 cm. tall, sometimes only 20–30 cm., the lower internode rather copiously glandular-villous or pilose, and usually with an underlying pubescence of short glandular trichomes; petioles of the basal leaves 10–30 cm. long, glandular-pubescent; blades 6–12 cm. broad, copiously pubescent, roundish-pentagonal in outline, 5–7-parted, the segments rhombic to obovate, deeply and sharply incised, the ultimate lobes usually oblong-lanceolate, acute or acuminate; basal sinus acute; cauline leaves similar, smaller pilose or hispidulous, sometimes glandular, the lobes longer and more tapering, and separated by sinuses of about 60 degree angles; stipules attenuate-lanceolate, 5–15 mm. long, villous, more or less glandular; inflorescence compactly cymose in the early part of the season, later becoming looser; peduncles 1.5–6 cm. long, these, as well as the pedicels and calyces, densely glandular-villous; pedicels in early summer 0.5–1.5 cm. long, erect, later 1.5–3 cm. long, becoming reflexed and bent upward in fruit; sepals 8–12 mm. long, oval to lanceolate, the outer ones densely glandular-villous; mucro 2–3 mm. long; petals 1.2–2 cm. long, entire or emarginate, rose-purple or rarely white, conspicuously dark-veined, pilose about one-fifth their length; filaments ciliate three-fourths their length; mature stylar column 2.5–3

cm. long, densely glandular-villosulous; stylodia 4–5 mm. long; carpel-bodies 5–6 mm. long, glabrate near the apex, glandular-pubescent, with tuft of hairs at the base, the trichomes less than 1 mm. long; seeds 3–4 mm. long, reticulate.—Ind. Sem. Hort. Petrop. xi. suppl. 18 (1846); Rydberg, Contr. U. S. Nat. Herb. iii. 489 (1896), Mem. N. Y. Bot. Gard. i. 264 (1900); Piper, Contr. U. S. Nat. Herb. xi. 379 (1906); Hanks & Small in N. Am. Fl. xxv. 13 (1907); Coulter & Nelson, New Man. Rocky Mt. Bot. 303 (1909); Knuth in Engler, Pflanzenr. iv. (129) 117 (1912); Piper & Beattie, Fl. Se. Wash. & Adj. Idaho, 155 (1914); Henry, Fl. So. Brit. Columbia, 198 (1915); Rydberg, Fl. Rocky Mts. 532 (1917); Tidestrom, Contr. U. S. Nat. Herb. xxv. 337 (1925); Rydberg, Fl. Prairies & Plains, 501 (1932); St. John, Fl. Se. Wash. & Adj. Idaho, 243 (1937); Graham, Ann. Carnegie Mus. xxvi. 259 (1937); Peck, Man. Higher Pl. Oregon, 462 (1941). *Geranium incisum* sensu Newberry, Pac. R. R. Repts. vi. 68 (1857); Trelease in Mem. Boston Soc. Nat. Hist. iv. 74 (1888), ex p. and in Gray, Syn. Fl. i. 359 (1897) ex p.; Howell, Fl. Nw. Am. 106 (1897) ex p. Non Andrews, Bot. Rep. i. t. 67 (1797), nec Nutt. ex Torr. & Gray (1838). *Geranium viscosissimum* var. *album* Suksdorf, Werdenda, i. 24 (1927). *Geranium viscosissimum* f. *album* St. John, Proc. Biol. Soc. Washington, xli. 195 (1928).—Prairies, hillsides, canyons, riverbanks, open woods, and meadows, from British Columbia, Alberta, and Saskatchewan to western South Dakota, northwestern Nevada, and northern California.—TYPE LOCALITY: "Hab. in America septentrionali occidentali". Representative specimens: BRITISH COLUMBIA: Spences Bridge, *John Macoun*, May 30, 1889 (NY); between Kettle & Columbia Rivers, *John Macoun* 63698 (NY, G); Williams Lake, *D. Fraser*, June 18, 1921 (NY); Riske Creek, Chilcotin, *W. A. Newcombe*, June 11, 1915 (G); Ashcroft, *H. C. Cowles* 257 (UI, F); Pavilion Mountain, Lillooet, *T. T. McCabe* 229 (UC); Fraser River, near Marguerite, *T. T. McCabe* 1297 (UC); Alkali Lake, *T. T. McCabe* 945, 1307 (UC); 14 miles north of Kamloops, *T. T. McCabe* 2397 (UC); Merritt, *T. T. McCabe* 4504 (UC); Crow's Nest Pass, *T. T. McCabe* 4894 (UC). ALBERTA: Beaver River, *A. H. Brinkman* 3045 (NY); Medicine Hat, *H. H. Rusby*, July 29, 1915 (NY); foothills of Rocky Mts., *John Macoun* 49, 50 (G); Sarcee Reserve, *Goddard* 407 (UC). WASHINGTON: Almota, Whitman Co., *Constance & Rollins*, et. al. 1074 (NY, F, UC, G); Clark Springs, Spokane Co., *F. O. Kreager* 25 (NY, G, UC), *Beattie & Chapman* 2012, 2021 (UC); Spokane Co., *W. N. Suksdorf* 262 (F, G); Spangle, Spokane Co., *W. N. Suksdorf* 8710 (NY, G, UI, UC); Pullman, *C. V. Piper* 1646 (G), *A. D. E. Elmer* 47 (NY), 2413 (UC); Rock Lake, Whitman Co., *Sandberg & Leiberg* 106 (NY, G, F, UC, UI); Colville Reservation, *Griffiths & Cotton* 409 (NY); Wellpinit, Stevens Co., *L. Constance*

1839 (G, UC); Waitsburg, *R. M. Horner* R115B122 (G); Ellensburg, Kittitas Co., *G. Neville Jones* 10170 (UI). OREGON: Fort Dalles, *Dr. Geo. Suckley* in 1855 (NY); The Dalles, *H. Edwards*, July 1873 (NY), *Harford & Dunn*, June 10, 1869 (NY); Imnaha, Wallowa Co., *M. E. Peck* 17673 (NY). IDAHO: Sawtooth, *B. W. Evermann* 563 (F, NY); Payette National Forest, Valley Co., *J. William Thompson* 13737 (NY, G, F, UC); Beaver Canyon, *C. L. Shear* 3055 (NY), *A. Isabel Mulford*, August 10, 1892 (NY); *A. A. & E. Gertrude Heller* 3155 (NY, UC); Trinity, Elmore Co., *J. F. Macbride* 558 (NY, F, G); Devil Creek, Owyhee Co., *Nelson & Macbride* 1741 (NY, G), 1856 (G); Moscow, Latah Co., *L. F. Henderson* 2752 (G), *LeRoy Abrams* 616 (UC); Henry Lake, Fremont Co., *E. B. & Lois B. Payson* 2019 (G); 15 mi. south of West Yellowstone, *B. & Ruth Maguire* 1188 (UC); Kootenai Co., *Leiberg* 423 (UC). CALIFORNIA: Quartz Valley, Siskiyou Co., *G. D. Butler* 1458 (UC). SASKATCHEWAN: *E. Bourgeau* in 1858 (G). MONTANA: Jack Creek Canyon, *Rydberg & Bessey* 4514 (NY, F, G, UC); Helena, *B. T. Butler* 782, 792, 4042 (NY); Big Fork, *B. T. Butler* 2221, 2223, 2263 (NY); Tobacco Mts., *B. T. Butler*, July 13, 1909 (NY); Midvale, *L. M. Umbach* 171 (NY, F) 560 (NY); Park Co., *F. Tweedy*, June 1889 (NY); Missoula, *W. O. Craig* 8 (NY); Columbia Falls, *R. S. Williams*, July 15, 1894 (NY); Many Glacier, Glacier National Park, *G. Neville Jones* 5343 (NY); Little Belt Mts., *J. H. Flodman* 652 (NY); Missoula, *D. T. MacDougal* 139 (NY); Phillipsburg, *A. C. Titcomb*, July 1884 (G); Miller Canyon, Missoula Co., *C. L. Hitchcock* 1800 (G); Sedan, *B. J. Jones*, July 1901 (G); Big Prairie, Flathead National Forest, *J. E. Kirkwood* 2221 (UC). WYOMING: Big Horn Mts., Sheridan Co., *Tweedy* 78 (NY); Rapid Creek Park, Sheridan Co., *Pammel & Stanton*, July 1897 (NY); Laramie Peak, Albany Co., *Aven Nelson* 7591 (NY, G); Sundance Mt., *Aven Nelson*, July 3, 1896 (NY); Piney and Beaver creeks, *C. C. Curtis*, July 22–31, 1900 (NY); near Leckie, *Merrill & Wilcox* 763 (NY, G); Alpine, Lincoln Co., *Payson & Armstrong* 3491 (UI, G); Moran, Teton Co., *C. L. Hitchcock*, et al. 3864 (UC); Merna, Sublette Co., *E. B. & Lois B. Payson* 2733 (UC). YELLOWSTONE NATIONAL PARK: Mammoth Hot Springs, *F. H. Burglehaus*, July 1893 (UI, UC), *E. A. Mearns* 1975 (NY); Snow Pass, *E. A. Mearns* 3811 (NY); Crescent Hill, *H. L. Mason* 3454 (UC); Undine Falls, *Aven & Elias Nelson* 5691 (NY, G). SOUTH DAKOTA: Rochford, *Rydberg* 584 (G, NY); without definite locality, *John Torrey* in 1875 (G); Deerfield, *E. J. Palmer* 37480 (G); Black Hills, *H. E. Hayward* 1192, 1416, 2189, 2308, 2742 (F).

Geranium viscosissimum and *G. strigosius* are closely allied. They have similar habitats and geographical ranges, and on this account have often been poorly distinguished. However, they

are distinct species, and to the student familiar with them in the field, they present quite different facies. *G. viscosissimum* is darker and coarser on account of the abundant yellowish-green glandular pubescence on the stems, petioles, and often on the leaf-blades. *G. strigosius* is a plant of more delicate and slender habit; it is grayish-green, due to the pale, less glandular indument. As in other species of this genus, occasional plants of *G. viscosissimum* have white petals, a fact which has led certain authors to conclude that the white-flowered plants should be latin-named as a separate variety or form. However, a series of specimens shows that the pigmentation of the petals varies from white to pale lavender to deep purple; no other distinguishing characters are present to uphold the view that the plants characterized by absence of pigment in the petals are genetically separate from the usual purple-flowered ones.

6. G. STRIGOSIUS St. John. Perennial with simple caudex; stem solitary, erect, 30–75 cm. tall, the lower internode strigillose or strigose to rather densely retrorsely pubescent with whitish, non-glandular trichomes, less commonly nearly glabrous, not at all glandular; petioles of the basal leaves puberulent to strigose, 5–25 cm. long; blades 3–10 cm. broad, strigillose or pilosulous on both surfaces, especially along the veins, pentagonal in outline, deeply 5–7-parted, the segments obovate to rhombic in outline, the sinuses acute, the lobes incised, with acute tips; cauline leaves similar, smaller, short-petioled, and with deeper, less intricately lobed divisions; stipules linear-lanceolate, attenuate, 5–20 mm. long, densely puberulent, ciliate; inflorescence terminal, compactly cymose; peduncles 0.5–3 cm. long, pilosulous or more or less glandular; pedicels usually paired, frequently 3 or 4, densely glandular-villosulous, 1–5 cm. long, reflexed and bent upward in fruit; sepals oval, 8–10 mm. long, the outer prominently veined and glandular-villosulous; mucro 1–2 mm. long; petals broadly obovate, emarginate or obtuse, 1.5–2 cm. long, rose-purple, paler at the base with dark veins, pilose less than one-fourth their length; mature stylar column 3–3.5 cm. long, more or less glandular-pubescent; stylodia 4–5 mm. long; carpel-body 6 mm. long, puberulent to glandular-pubescent, especially on the keel; seeds 3.5–4 mm. long, reticulate.—Fl. Se. Wash. & Adj. Idaho, 243 (1937). *Geranium erianthum* sensu Lindley in Edwards, Bot. Reg. *t. 52* (1842); Torrey in Bot. Wilkes Exped. 251 (1874). Non DC. (1824). *Geranium Hookerianum* β *incisum* Walpers, Rep. Bot. Syst. i. 450 (1842). *Geranium maculatum* sensu Engelm. in Gray, Mem. Am. Acad. n. s. iv. 27 (1849). Non L. (1753). *Geranium Richardsonii* sensu Wats. Bot. King Exped.

v. 49 (1871), ex p. Non Fisch. & Trautv. (1837). *Geranium Fremontii* sensu Macoun, Cat. Can. Pl. i. 90 (1883). Non Torr. (1849). *Geranium incisum* sensu Trelease, Mem. Boston Soc. Nat. Hist. iv. 74 (1888), ex p.; Howell, Fl. Nw. Am. 106 (1897); Trelease in Gray, Syn. Fl. i. 359 (1897), ex p.; Hanks & Small in N. Am. Fl. xxv. 14 (1907); Knuth in Engler, Pflanzenr. iv (129). 116 (1912); Taylor in Bailey, Stand. Cyclop. Hort. 1332 (1915); Henry, Fl. So. Brit. Columbia 198 (1915); Rydberg, Fl. Rocky Mts. 532 (1917); Jepson, Man. Fl. Pl. Calif. 590 (1925), Fl. Calif. ii. 405 (1936); St. John, Fl. Se. Wash. & Adj. Idaho, 242 (1937). Non Andrews, Bot. Rep. i. *t. 67* (1797), nec Nutt. ex Torr. & Gray (1838). *Geranium nervosum* Rydberg, Bull. Torr. Club, xxviii. 34 (1901); Hanks & Small in N. Am. Fl. xxv. 18 (1907); Knuth in Engler, Pflanzenr. iv (129). 115 (1912); Rydberg, Fl. Rocky Mts. 531 (1917). *Geranium strigosum* sensu Rydberg, Bull. Torr. Club, xxix. 243 (1902); Hanks & Small in N. Am. Fl. xxv. 13 (1907); Knuth in Engler, Pflanzenr. iv (129). 118 (1912); Rydberg, Fl. Rocky Mts. 532 (1917). Non N. L. Burm., Fl. Cap. Prodr. 19 (1768), nec Franch. in Bull. Soc. Bot. France, xxxii. 442 (1886). *Geranium canum* Rydberg ex Hanks & Small in N. Am. Fl. xxv. 14 (1907); Rydberg, Fl. Rocky Mts. 532 (1917). *G. viscosissimum* sensu E. H. Graham, Ann. Carnegie Mus. xxvi. 259 (1937). Non Fisch. & Mey. 1846.—Hillsides, canyons, open woods, meadows, and stream-banks, British Columbia and Alberta to Montana, Wyoming, western South Dakota, Colorado, Utah, Nevada, and northeastern California.—TYPE LOCALITY: Copperton, Carbon Co., Wyoming. TYPE collected June 20, 1901, by *Frank Tweedy* 4591 (NY). Representative specimens: ALBERTA: Milk River Ridge, *John Macoun* 10079, July 18, 1895 (G); Calgary, *M. E. Moodie* 242 (NY). WASHINGTON: Ellensburg, Kittitas Co., *G. Neville Jones* 10145 (UI); without definite locality, *G. R. Vasey* 218, 219, in 1889 (NY, G); Blue Mts., Walla Walla Co., *C. V. Piper* 2399 (G); Yakima Region, *T. S. Brandegee* in 1882 (UC); Upper Naches River Region, *J. M. Grant*, June 1930 (UC). OREGON: Hilgard, Union Co., *M. E. Peck* 17455 (NY); Canyon City, Grant Co., *G. C. Bellinger*, April 26, 1934 (NY); Blue Mts., Grant Co., *L. F. Henderson* 5323 (G); Steins Mts., *Griffiths & Morris* 586 (NY); Anderson Valley, Steins Mts., *J. B. Leiberg* 2401 (NY, G, F, UC); Powder River Mts., *C. V. Piper*, Aug. 1896 (G); Eastern Oregon, without definite locality, *W. C. Cusick* 2154 (G, UC); Beulah, Malheur Co., *J. B. Leiberg* 2299 (NY, G, UC, F); Swan Lake Valley, Klamath Co., *E. I. Applegate* 967 (UC, F); Pendleton, *W. Sherwood* 208 (F). CALIFORNIA: Warner Mts., Modoc Co., *Mrs. M. H. Manning* 42 (UC); Davis Creek, *Mrs. R. M. Austin*, Aug. 1894 (UC); Goose Lake Valley, *Mrs. R. M. Austin* 2259 (NY, UC); Willow Creek, Modoc Co., *Mrs. R. M. Austin* 218

(UC); Modoc Co., *Milo S. Baker*, July 15, 1893 (NY, UC). MONTANA: Bozeman, Gallatin Co., *V. K. Chestnut & W. W. Jones* 153 (NY), *E. J. Moore*, June 1, 1901 (UC); Flathead National Forest, *J. E. Kirkwood* 2221 (G); Red Lodge, Carbon Co., *C. H. Draper*, June 11, 1905 (UC). WYOMING: Shoshone National Forest, *L. O. & Rua P. Williams* 3748 (NY, G); Big Horn Mts., Sheridan Co., *R. C. Rollins* 501 (NY, G), *F. Tweedy* 2643 (NY); headwaters of Clear Creek and Crazy Woman River, *F. Tweedy* 3647 (NY); Powder River, Big Horn Co., *L. N. Goodding* 286 (NY, F, G); Copperton, Carbon Co., *F. Tweedy* 4591 (type of *G. strigosum* Rydb., NY); Evanston, *J. A. Sanford* 268 (UC); Fish Creek, Teton Forest Reserve, *F. Tweedy* 494 (type of *G. nervosum* Rydb., NY). SOUTH DAKOTA: Black Hills: Deerfield, *H. E. Hayward* 2373 (F); Crooks Tower, *H. E. Hayward* 2742 (F). IDAHO: Tamarack, Washington Co., *June A. Clark* 204 (NY, G, F, UC); Boise, *J. F. Macbride* 263 (NY, G, UC), *June A. Clark* 78 (NY, G, F, UC); Silver City, Owyhee Co., *J. F. Macbride* 959 (F, NY, G, UC); House Creek, Owyhee Co., *Nelson & Macbride* 1819 (NY, G, UC); Pocatello, *Mrs. M. E. Soth* 183 (NY); Corral, Blaine Co., *Macbride & Payson* 2931 (NY, G, UC); Hatwai Creek, Latah Co., *L. F. Henderson* 2753 (G); McCall, Valley Co., *Constance & Pennell* 1972 (G, UC); Tetonia, Teton Co., *B. O. Schreiber* 1215 (UC). UTAH: Silver Lake, *Rydberg & Carlton* 6440 (NY); Salt Lake City, *Rydberg* 6045 (NY), *F. E. Leonard* 123 (NY, UI, UC); Salt Lake Co., *A. O. Garrett* 2380a (NY); Brush Creek Canyon, Uintah Mts., *L. N. Goodding* 1291 (NY, G); Uintah Mts., *H. J. Fuller*, Aug. 10, 1933 (UI); Black Rock, *S. Watson* 204 (NY, G); Bear River, Summit Co., *E. B. & Lois B. Payson* 4829 (NY, G, UC); Abajo Mts., *Rydberg & Garrett* 9243 (NY); Elk Mts., *Rydberg & Garrett* 9562 (NY); La Sal Mts., *Rydberg & Garrett* 8614 (NY); St. George, *E. Palmer* in 1875 (G); Peterson, *Pammel & Blackwood* 3858 (G); Vernal, *E. H. Graham* 6348 (G); Wellsville, *J. A. Moore* 1042 (G); Little Lake, *E. H. Graham* 8220 (F, G); City Creek, *Mrs. Joseph Clemens*, May 28, 1908 (G); Ogden, *W. W. Jones* 414 (G); Cottonwood Canyon, *F. B. Wann* 3538 (UC); Garden City, *R. Hammond* 3537 (UC). NEVADA: Mountain City, Elko Co., *Nichols & Lund* 364 (NY); Gold Creek, Elko Co., *Nelson & Macbride* 2129 (NY, G), *Nichols & Lund* 505 (NY); Martin Creek, Elko Co., *P. B. Kennedy* 4268 (G); Austin, Lander Co., *P. B. Kennedy* 4025 (G); Head of Big Creek, Humboldt Co., *Taylor & Richardson* 75 (UC). COLORADO: Routt Co., *C. S. Crandall*, July 19, 1894 (NY); Grizzly River, near foot of Rabbit Ear Range, *C. S. Crandall* 113 (G); Grizzly Creek, *C. F. Baker*, July 19, 1896 (NY); Gunnison Watershed, *C. F. Baker* 155, 622 (NY, G, UC); between Pallas and Sydney, *Shear & Bessey* 5286 (NY); Mount Carbon, *Tidestrom* 3521 (UC); Tongue Creek Camp, Delta Co., *C. A. Purpus* 305 (F).

Plants of this species resemble in their general habit *G. viscosissimum* and *G. Richardsonii*. They have the purple petals that are pilose less than one-fourth their length, as does the former, but they differ in having the short-pubescent type of indument, glandless on stems and petioles, while *G. viscosissimum* is more or less glandular-villous throughout. In poorly prepared herbarium specimens it is frequently difficult to determine whether the petals are white or purple, and occasionally it is difficult to decide whether a plant belongs to *G. strigosius* or to the white-flowered *G. Richardsonii* which has a similar range, habitat, and habit. In the field, however, the species are instantly distinguishable. The petals of *G. strigosius* are pilose less than one-fourth their length; those of *G. Richardsonii* have indument that extends one-half their length. The pedicels of the latter are always paired; those of the purple-flowered species (e. g., *G. strigosius* and *G. viscosissimum*) sometimes have peduncles bearing more than two flowers. *G. strigosius* is easily distinguished from *G. Richardsonii* by the presence of tawny glandular pubescence on the pedicels of the former, while in the latter the pedicels are densely glandular-villosulous with purple-tipped trichomes.

As previously noted in the discussion under *G. oreganum*, we find that the entity described by Torrey & Gray in 1838 as *G. albiflorum* β*? incisum*, and later given the specific name *G. incisum* by Trelease in 1888, does not represent the Rocky Mountain species (i. e., *G. strigosius*) which has since borne this name, but is instead the Pacific Coast species, *G. oreganum* Howell. We cannot use the name *G. incisum* because this binomial was previously used for a South African species by Andrews in 1797.

In his critical study of the Rocky Mountain species of *Geranium*, Rydberg (1917) treats the entity *G. strigosius* as two species; one with larger, lanceolate, short-hirsute sepals he calls *G. incisum*, the other, with sepals 8 mm. long, oval, densely glandular, as *G. strigosum*. Actually, the type of indument and size of sepals do not show corresponding variation, the dense glandularity occurring on both the large and small sepals. Rydberg also mentioned the strigose foliage of the plant he called *G. strigosum*, but this is another character that does not invariably hold. Examination of a series of specimens shows that there is

only one species. This has been correctly designated by H. St. John (1937) as *G. strigosius* since the name *G. strigosum* is preoccupied.

A few specimens of *G. strigosius* have been collected in northern California. One of these (Davis Creek, *Mrs. R. M. Austin*, Aug. 1894), determined and distributed by E. L. Greene, was labelled by Greene with a manuscript name which was never published. Another of these Californian specimens is from the Warner Mts., Modoc Co. (*Mrs. M. H. Manning* 42), which is the type locality for *G. attenuilobum*. These two species are closely related and are distinguished mainly by the attenuately lobed upper leaves and the usually abundantly pilose petals of *G. attenuilobum*.

(*To be continued*)

A FLORA OF ARIZONA.—This work[1], so long in preparation, is the thorough and scholarly treatment which the reputations of the authors and their twenty-four collaborators would lead one to expect. On the physical side, it is well-printed, the type being rather large and clear, not overly bulky despite its great length, and inexpensive. In addition to the floristic treatment, it contains a brief survey of botanical exploration in Arizona, the geographical relationships of the flora, an illuminating discussion of the vegetation (by Forrest Shreve), and a bibliography dealing with the vegetation and "uses and popular interest." There are, too, a frontispiece and twenty-nine plates (reproduced from photographs), showing vegetation types and interesting species. Nine of these plates are devoted to cacti, and, together with the keys to the genera of that family, these might well be of interest to eastern, as well as western, cactus-fanciers. Interesting as these adjuncts are, however, it is naturally the treatment of the flora (about 3200 species) which must be primarily considered.

In the first place, there are a few minor points of criticism (and they are minor) which are worth making, in anticipation of a reissue or a second edition. It would be of considerable assistance if family names could be used as running-heads to the pages. The family name *Saxifragaceae* is omitted at the beginning of the family treatment. *Iris arizonica* Dykes, described from living plants grown from seed taken from an Arizona collection, probably *Blumer*, no. 1556, is omitted, even from synonymy. Two genera, *Frasera* and *Swertia*, are maintained as distinct, although this might well have been changed had St. John's treatment of the two as *Swertia* appeared before this book went to press. The correct name for *Cuphea ignea* (p. 620) is *C. platycentra* Lem.

[1] *Flowering Plants and Ferns of Arizona* by T. H. KEARNEY AND R. H. PEEBLES AND COLLABORATORS. 1069 pp. U. S. Dept. of Agriculture, Misc. Publ. no. 423. 1942. $2.

On the other hand, the work seems complete, careful, and, for the most part, conservative, this last characteristic being well shown in the treatment of *Gilia*. There has been no undue slaughter of species, and there is a willingness to recognize varieties generously. Attention has been paid throughout to economic values, especially to forage plants, and to ethnobotanical information. Since descriptions of species could not be included without greatly increasing the bulk (and the price), the keys to genera are highly detailed, and the distributional notes for the species are given more minutely than usual. One notes, too, with pleasure, the restoration of the *Oxalidaceae* to the flora of Arizona. In view of the differences in length, it would be rather unfair to draw comparisons between the contributions of the collaborators, but (possibly from a sense of personal relief), attention might be drawn to Dr. Blake's key to the groups of the *Compositae*, and keys to the genera within these groups. The former is drawn up without mention of style, stigma, or nature of the receptacle. In the latter keys, style- or stigma-characters appear to be used in only three instances; indeed, only once as the primary character in the heading. This must inevitably make the utilization of these keys easier and quicker, even for professional botanists. The ultimate test for such a volume is that of *use*. The writer and some colleagues have, on several occasions, made numerous determinations of Arizona material, with highly satisfactory results. The authors have reached the standards they set for themselves.—Robert C. Foster.

Alchemilla pratensis in Erie County, New York.—A flowering plant of extreme interest and rarity in North America has been added to the flora of western New York State. The species, *Alchemilla pratensis*, F. W. Schmidt, was discovered by me, growing in a long-neglected field near Lancaster, Erie County, New York.

This plant, naturalized from Europe where it is known as "Lady's Mantle," is abundantly naturalized in Nova Scotia, and has occasionally been reported as a local plant from Maine to eastern New York.

Alchemilla pratensis is an attractive non-typical member of the Rose family and of unusual botanical interest. Its flowers, having no petals, are made up of a small greenish cup-shaped calyx that is mainly 4-lobed and bears only 4 stamens. A more unrose-like blossom can hardly be imagined.

A fine specimen collected by me is now growing vigorously in Williamsville, N. Y., in the garden of Professor William P. Alexander, Curator Emeritus of Adult Education, Buffalo Museum of Science.—Heather G. Thorpe, Buffalo Museum of Science.

AN IMPORTANT BIOGRAPHY.—Every botanist, as well as others who are interested in the development of that science, and many more who enjoy getting intimately into touch with a great and lovable man, will want the account of John Torrey by the experienced biographer, Andrew Denny Rodgers III[1]. Torrey, a pioneer in American botany and, at the same time, an investigator in chemistry, was the revered teacher of and, later, collaborator with Asa Gray. He was in close touch with all prominent and less known botanists of his time and the voluminous long-hand correspondence from which Mr. Rodgers has freely drawn gives us a vivid picture of a man as simple and sincere as he was great, if there is any difference. The biography is skillfully and sympathetically prepared. Many readers of RHODORA will want it.—M. L. F.

NEW COMBINATION IN PYRUS.—Prior to a publication on the woody plants of Maine, it appears desirable to publish the following new combination:

PYRUS **decora** (Sarg.), comb. nov. *P. americana* var. *decora* Sargent, Sylva N. Am. **14:** 101, 1902. *Sorbus decora* (Sarg.) Schneider, Bull. Herb. Boiss. II. **6:** 313, 1906; G. N. Jones, Journ. Arnold Arb. **20:** 25, 1939.—F. HYLAND, University of Maine.

[1] *John Torrey, a Story of North American Botany*, by ANDREW DENNY RODGERS III. Princeton University Press, Princeton, New Jersey, 1942, 352 pp. Price $3.75.

Volume 44, no. 528, including pages 453–511, plates 737–744, and title-page of volume, was issued 26 December, 1942.

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

Vol. 45. February, 1943. No. 530.

CONTENTS:

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—**A monthly journal of botany, devoted primarily to the flora of the Gray's Manual Range and regions floristically related. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) of not more than 24 pages and with 1 plate, 20 cents, numbers of more than 24 pages or with more than 1 plate at higher prices (see 3rd cover-page). Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application; volumes 35–43 can be supplied at $4.00 per volume, net, and some single numbers from them only at advanced prices (see 3rd cover-page). Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.**

Address manuscripts and proofs to

M. L. Fernald, 14 Hawthorn Street, Cambridge, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to

Ludlow Griscom, 8 W. King St., Lancaster, Pa., or, preferably, Museum of Comparative Zoology, Cambridge, Mass.

Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 45. **February, 1943.** **No. 530.**

THE "COÛDRES" OF THE "YSLE ES COULDRES"

BERNARD BOIVIN

IN 1535, Jacque CARTIER, the discoverer and first explorer of the Saint Lawrence River, found in the Gulf of Saint Lawrence a small island where *Corylus rostrata* was so abundant that he named the island "*l'ysle es couldres*"[1]. *Couldre* was at the time, and still is, the common name in French for *Corylus Avellana*. That common name is equally in use in the French dialects of the following regions: *Bas-Maine, Berry, Nivernais, Normandie*[2]. It is now written *Coûdre*.

The name CARTIER gave to that island is still the only one used to designate it, but the presence of *Corylus* has been recently questioned.

In 1876, R. H. CASGRAIN[3] published a monographic study of this small corner of land. He could not fail to verify if the island still deserves its name, and he effectively found *Corylus rostrata* to be very abundant at the "*Ruisseau à la Lessive*", the very spot where CARTIER landed on September 6, 1535. "*Le paysage*", he adds, "*n'a guère changé d'aspect*".

J. A. G. CREIGHTON[4] also described the Île-aux-Couldres as it stood about 1880. It was then spread over with "*clumps of spruce and cedar, . . . groves of maple and birch and hazel*".

In 1917, Marie-VICTORIN[5] spent a week on the island. He could not find any *Corylus rostrata* but reported from *ouï-dire*

[1] BIGGAR, H. P., The Voyages of Cartier, 1924.
[2] Glossaire du Parler Français au Canada, 234, 1930.
[3] Un Pèlerinage à l'Ile-aux-Couldres, 138, 1876.
[4] GRANT, G. M., Picturesque Canada, **2**: 707–710, 1882.
[5] Can. Field Nat., **33**: 116, 1919.

that there previously were a few. Here is what he writes about the ecological conditions at the *Mouillage:* «Cartier's landing place, the so called "Ruisseau à la Lessive" is yet in its natural state, and it is very hard to believe that the ecological conditions have changed enough in four centuries to expel the hazelnut from the island. Were it not for the express mentioning of the fruits our opinion would be that Cartier was simply mistaken as to the identity of the shrub, and that his hazelnut was nothing else than the Common Northern Alder (*Alnus incana* (L.) Moench) which is very abundant in the damp places about "Ruisseau à la Lessive"».

In the fall of 1936, Marie-VICTORIN took the opportunity of his *Cours de Floristique* to discuss the problem anew. He specified that it was not solved yet, that one should investigate carefully in order to verify whether there were still some *Corylus rostrata* on the *Île-aux-Couldres.*

The following year, Jacques ROUSSEAU[1] fully discussed the problem and considered that the opinions of CASGRAIN and CREIGHTON were just little romances based upon Cartier's text, and that *Corylus rostrata* is now absent from the island.

During the summer of the same year, Marcelle GAUVREAU and Claire MORIN found a few Hazelnuts near the *Pointe des Roches* wharf and brought back herbarium specimens.

In 1942, Jacques ROUSSEAU[2] reconsidered the question and, having learned of the Misses GAUVREAU's and MORIN's collection, he slightly modified his view about the presence of *Corylus rostrata* on the *Île-aux-Couldres: "Il n'en reste plus que quelques arbres au nord de l'île".*

One must note that the phonetic form of the vernacular name most often used in Charlevoix county is **coûdr**. *Coudrier* and *noisettier* are also used, although less frequently, and are accentuated on the last syllable.

Corylus rostrata is certainly one of the plants which are most familiar to the author. Up to 1937, he had gathered its fruits in large quantities every summer, often many bushels in a single season. Later on, having taken a permanent interest in botany, he collected it about half a dozen times and observed it at

[1] Contrib. Lab. Bot. Univ. Mont., **28**: 50, 1937.
[2] Bull. Soc. Géog. de Québec et de Montréal, **1**: 92, 1942.

different stages of its life cycle, in a large number of localities in the Québec Province, from the Matapédia Valley to the Montréal region as well as in New York state and in New England.

It is a shrub found in both natural and artificial habitats; it is locally abundant at the margins of woods, along fences, around rock piles. In the last two habitats, it often forms clumps so dense as to be impenetrable. It grows in deep soils, prefers slopes, more especially the lower part of hills and mountains. It needs a permanent water-table, neither superficial nor too deep, and a permeable soil.

In its natural habitat, it is usually found in mixed woods, sometimes in deciduous woods, more rarely in coniferous woods. It also thrives very well at the margin of the forest along the sea, always in soil conditions similar to those already described in its artificial habitats.

Being present at Marie-Victorin's *Cours de floristique* in the fall of 1936, the author became interested in this problem. Consequently he spent the day of August 24, 1937, on the *Île-aux-Couldres*, with the very purpose of looking for *Corylus rostrata*. In two hours he explored that part of the sea-cliff which runs from the *Pointe des Roches* wharf to the *Cap à Labranche*. And everywhere in the lower part of the cliff, as well as at the margin of the forest along the sea, *Corylis rostrata* is common. As a matter of fact, he never found it elsewhere so abundantly, in its native habitat. Herbarium specimens (no. 1577) were collected, he filled his pockets with fruits, some of which he ate, others he gave to friends, the rest were added to a bag of fruits of the same species collected at Les Eboulements. These fruits were given to the Montreal Botanical Garden for their 1938–39 Index Seminum.

One can safely presume that in Cartier's time, *Corylus rostrata* was equally abundant all along the cliff which nearly surrounds the Island. Nowadays, this cliff has been thoroughly cleared on the south side and the farmers find the land of the island too valuable to spare any for a weedy Hazelnut. But on the north side, especially at the *Mouillage* where Cartier landed, the *couldres* are as abundant to-day as they were four centuries ago.

Gray Herbarium

A REVISION OF THE PERENNIAL SPECIES OF GERANIUM OF THE UNITED STATES AND CANADA

G. Neville Jones and Florence Freeman Jones

(*Continued from page 26*)

7. G. Richardsonii Fisch. & Trautv. Perennial, the usually simple caudex covered with brownish marcescent scale-like leaf-bases and stipules; stems solitary or few, erect, 30–90 cm. tall, glabrous or sparsely pubescent; petioles of the basal leaves 5–20 (rarely 30) cm. long, glabrous or sparsely retrorsely strigose or pilose; blades 3–15 cm. broad, usually pentagonal in outline, deeply 5–7-parted, the rhombic segments several times lobed, lanceolate or ovate, acute or acuminate, sparsely strigose on the upper surface, and along the principal veins on the lower surface; cauline leaves 3–5-parted, sparsely strigose, with sharply incised and tapering lobes, or occasionally the uppermost lanceolate and serrate but not lobed; stipules lanceolate, attenuate, 6–12 mm. long, ciliolate, puberulent, or glabrous; inflorescence spreading-cymose, the peduncles 2–12 cm. long, glandular-pilose, with translucent trichomes 0.5–1 mm. long, tipped with purple glands; pedicels slender, 1–2 cm. long, paired, becoming reflexed and bent upward in fruit, rather copiously glandular-villosulous with straight, mostly purple-tipped trichomes; sepals 6–12 mm. long, lanceolate or narrowly oval, the outer ones more or less glandular-pubescent, at least toward the base or near the margins; mucro 1.5–2.5 mm. long; petals 10–18 mm. long, obovate, obtuse, entire, milk-white, or sometimes pink-tinted, usually with purple or pink veins, pilose inside for about one-half their length; filaments reddish purple, short-pilose three-fourths their length; mature stylar column 2–2.5 cm. long, glandular-villosulous, and with a shorter non-glandular pubescence; stylodia yellowish green, 3–5 mm. long; carpel-bodies 2.5–4 mm. long, sparingly pubescent and with scattered stiff hairs, hispid or glandular-hispid along the keel, the trichomes less than 1 mm. long; seeds 2.5–3.5 mm. long, coarsely reticulate.—Ind. Sem. Hort. Petrop. iv. 37 (1837); Gray, Plantae Fendl. [Mem. Am. Acad. ser. 2. iv.] 25. (1849); Engelm. in Gray, Mem. Am. Acad. n. s. iv. 27 (1849); Brewer & Watson in Bot. Calif. i. 94 (1880); Macoun, Cat. Can. Pl. i. 90 (1883); Trelease in Mem. Boston Soc. Nat. Hist. iv. 75 (1888); Coville in Contr. U. S. Nat. Herb. iv. 76 (1893); Trelease in Gray, Syn. Fl. i. 359 (1897); Howell, Fl. Nw. Am. 106 (1897); Rydberg in Mem. N. Y. Bot. Gard. i. 265 (1900); Hanks & Small in N. Am. Fl. xxv. 18 (1907); Coulter & Nelson, New Man. Rocky Mt. Bot. 303 (1909); Knuth in Engler, Pflanzenr. iv (129). 114 (1912); Hall & Hall, Yosemite Fl. 149 (1912); Wooton & Stand-

ley, Contr. U. S. Nat. Herb. xix. 380 (1915); Henry, Fl. So. Brit. Columbia, 198 (1915); Rydberg, Fl. Rocky Mts. 531 (1917); Tidestrom, Contr. U. S. Nat. Herb. xxv. 337 (1925); Jepson, Man. Fl. Pl. Calif. 590, *t. 584* (1925); Rydberg, Fl. Prairies & Plains, 501 (1932); Raup in Contrib. Arnold Arb. vi. 182 (1934); Munz, Man. So. Calif. Bot. 274, *t. 143* (1935); Jepson, Fl. Calif. ii. 405 (1936); E. H. Graham, Ann. Carnegie Mus. xxvi. 259 (1937); Peck, Man. Higher Pl. Oregon, 462 (1941); Tidestrom & Kittell, Fl. Arizona & New Mexico, 131 (1941). *Geranium albiflorum* sensu Hooker, Fl. Bor.-Am. i. 116, *t. 40* (1830), in Curtis' Bot. Mag. lix. *t. 3124* (1832); Torr. & Gray, Fl. N. Am. i. 206 (1838). Non Ledeb. Icon. Pl. Fl. Ross. i. 6, *t. 18* (1829), and Fl. Altaica, iii. 230 (1831). *Geranium Hookerianum* Walpers, Rep. Bot. Syst. i. 450 (1842). *Geranium pentagynum* Engelmann in Wislizenus, Mem. Northern Mexico, 90 (1848) and in Gray, Mem. Am. Acad. n. s., iv. 27 (1849). *Geranium gracilentum* Greene in Rydberg, Colorado Exp. Sta. Bull. c. 218 (1906). *Geranium loloense* St. John, Fl. Se. Wash. & Adj. Idaho 242 (1937).—Moist open woods and thickets, along creeks, in wet meadows, and springy places on hillsides; common from British Columbia and Saskatchewan southward to South Dakota, New Mexico, and California.—Type Locality: "Vallies in the Rocky Mountains. *Drummond*," between latitudes 52° N. and 54° N.—Representative specimens: British Columbia: Klappan River, *Preble & Mixter* 636 (US); Horsethief Creek, *Titus Ulke* 1253 (NY); along Wicked River, near the Peace, *Raup & Abbe* 3824 (NY, G); North Fork Illecillewaet, *J. M. Macmillian* 565 (NY, G); Mt. Selwyn, *Raup & Abbe* 3791 (G). Idaho: Musselshell Creek, Lolo Trail, Bitter Root Mts., *C. V. Piper* 4027 (NY, isotype of *G. loloense* St. John); Henry Lake, Fremont Co., *E. B. & Lois B. Payson* 1948 (G); Caribou Mountain, Bonneville Co., *Payson & Armstrong* 3523 (G, UI); Lochas River, Idaho Co., *Constance & Rollins* 1677 (G). Utah: Big Cottonwood Canyon, Salt Lake Co., *A. O. Garrett* 1520 (NY, G), *Rydberg & Carlton* 6488 (NY); Hammond Canyon, Elk Mts., *Rydberg & Garrett* 9578 (NY); Western Bear's Ear, Elk Mts., *Rydberg & Garrett* 9350 (NY, G); Gold Basin, La Sal Mts., *Rydberg & Garrett* 9073, 9074 (NY); La Sal Mts., San Juan Co., *H. C. Cutler* 2701 (NY), *E. B. & Lois B. Payson* 4093 (G, UC); Uintah Mts., *L. N. Goodding* 1317 (G); Chain Lakes Trail, Duchesne Co., *F. J. Hermann* 5241 (G); Alta, Wasatch Mts., *M. E. Jones* 1173 (NY, F); Abajo Mts., *Goodman & Hitchcock* 1450 (NY), 1452 (NY, UC, G); Bear River, Summit Co., *G. J. Goodman* 1874 (NY, G); Red Banks, *A. Isabel Mulford* 234 (NY); Fish Creek Canyon, Sevier Co., *A. O. Garrett* 2550 (NY). Nevada: Lake Tahoe, *D. R. Goddard* 1055 (UC); California: Donner Lake, Nevada Co., *C. F. Sonne* 43 (NY, UI, F), *A. A. Heller* 6997 (NY, UC, G);

Tulare Co., *Culbertson* 4382 (NY, UC, F, G); Echo Lake, El Dorado Co., *A. A. Heller* 13348 (NY, G, F, UI); Dry Lake Canyon, San Gorgonio Mts., San Bernardino Co., *Abrams & McGregor* 790 (NY, G); Bear Valley, San Bernardino Mts., *Leroy Abrams* 2831 (NY, G); Bluff Lake, San Bernardino Co., *S. B. Parish* 3784 (G), *I. W. Clokey* 5274 (NY, UC, G); Yosemite National Park, *H. M. Evans*, July 12, 1921 (F); Mill Creek Falls, San Bernardino Co., *S. B. Parish* 5065 (NY); San Bernardino, *W. G. Wright* in 1880 (G); Tioga Road near White Wolf, Sierra Nevada, *F. J. Smiley* 885 (G); Mono Lake, *W. H. Brewer* 1812 (G). ARIZONA: Grand Canyon of the Colorado, *T. F. Allen*, Aug. 1897 (NY); White Mts., Apache Co., *L. N. Goodding* 569 (NY, G), 1197 (NY); 45 mi. n. of Clifton, White Mts., *Kearney & Peebles* 12258 (NY); San Francisco Mt., *J. W. Toumey*, Sept. 10, 1894 (NY), *Cannon & Lloyd*, Aug. 1904 (NY); Rincon Mts., *J. C. Blumer* 3372 (G, UC). ALBERTA: Calgary, *Marion E. Moody* 1054 (NY, G, F, UC), 45 (NY, F); *M. A. Barber* 197 (G); Banff, *Butters & Holway* 89 (G); Lake Louise, *F. W. Hunnewell* 4230 (G). SASKATCHEWAN: *E. Bourgeau* in 1858 (NY, G); Farewell Creek, *John Macoun* 10082 (NY); Cypress Hills, *John Macoun* 74 (F). MONTANA: Glacier National Park, *G. Neville Jones* 5478 (NY, G); Cutbank Creek, Glacier National Park, *C. L. Hitchcock* 2013 (G); Lewis & Clark Forest, *J. E. Kirkwood* 2310 (G); Jones Canyon, Gallatin Co., *E. J. Moore*, July 28, 1900 (G); Sedan, Gallatin Co., *B. J. Jones*, July 28, 1901 (G); Terminus Canyon, *S. Watson* 68 (G); Wilsall, Park Co., *W. N. Suksdorf* 7 (G); Helena, *B. T. Butler*, 778 (NY); Midvale, *L. M. Umbach* 171a (F); Tobacco Mts., *B. T. Butler* 4232 (NY); Little Belt Mts., *J. H. Flodman* 654 (NY); Jack Creek Canyon, *Rydberg & Bessey* 4516 (NY); Big Belt Mts., *J. W. Blankinship*, Aug. 14, 1899 (NY); Summit, *R. S. Williams*, July 25, 1894 (NY). SOUTH DAKOTA: Lower Elk Canyon, *A. C. McIntosh* 1278 (NY); Elk Canyon, *Rydberg* 583 (NY); Elk Creek, Nemo, *G. Neville & Florence Freeman Jones* 14854 (UI); North Rapid Creek Ranger Station, *J. Murdoch* 3003 (NY, F, G); Rapid City, *T. A. Williams* 364 (NY); Spearfish Canyon, *H. E. Hayward* 138 (NY, F); Deadwood, *W. P. Carr* 168 (F, G), *E. J. Palmer* 37063 (G); Boulder Canyon near Sturgis, *G. Neville & Florence Freeman Jones* 14844 (UI). WYOMING: Sheridan Co., *L. O. & Rua Williams* 3206 (NY, G); between Sheridan & Buffalo, *F. Tweedy* 3645 (NY); Battle, Carbon Co., *F. Tweedy* 4594 (NY); Fish Creek, Teton Forest Reserve, *F. Tweedy* 495 (NY); Yellowstone National Park, *F. Tweedy* 232 (NY), *C. H. Hall*, June 1888 (NY), Obsidian Creek, *Aven & Elias Nelson* 6084 (NY, G); *G. Neville & Florence Freeman Jones* 14808 (UI); Shoshone National Forest, Park Co., *L. O. & Rua Williams* 3512 (NY, G); near Centennial, Albany Co., *R. C. Rollins* 935 (NY), *G. Neville & Florence Freeman Jones* 14607

(UI); Antelope Basin, Albany Co., *Aven Nelson* 7491 (NY, G); Pole Creek, *Aven Nelson* 1403 (NY); Shell Canyon, Big Horn Mts., *G. Neville & Florence Freeman Jones* 14827 (UI); Paintrock Creek, Big Horn Mts., *J. G. Jack*, Aug. 4, 1900 (G); Fremont Lake, Sublette Co., *E. B. & Lois B. Payson*, 2858 (G, F, UC); Leckie, *Merrill & Wilcox* 534 (G); Camp Crawford, *Mrs. Joseph Clemens*, Aug. 6, 1908 (G); Willow Creek, *Elias Nelson* 95 (NY), 3369 (F). COLORADO: Headwaters of Clear Creek, east of Middle Park, *C. C. Parry* 112 (NY, G); Four-mile Hill, Routt Co., *C. F. Baker*, July 22, 1896 (NY); Columbine, *F. Tweedy* 4592 (NY); Rio Blanco Creek, Archuleta Co., *R. C. Rollins* 1542 (NY, UI); La Veta, Huerfano Co., *R. C. Rollins* 1285 (NY, G); Lake Brennan, Gunnison Co., *R. C. Rollins* 1455 (NY, G, UI); Mount Carbon, Gunnison Co., *W. W. Eggleston* 5802 (G); So. Park, *Miss E. L. Hughes* 14 (G); La Plata, *Baker, Earle & Tracy* 673 (NY, F, G); Mancos, *Baker, Earle & Tracy* 44 (NY, F, UC, G); Piedra, *C. F. Baker* 449 (G, NY, UC, F, type collection of *G. gracilentum* Greene); Bob Creek, La Plata Mts., *Baker, Earle & Tracy* 195 (NY, F); North Park Range, Routt Co., *L. N. Goodding* 1796 (NY, G); Artist's Glen, Pike's Peak, *H. M. Hall* 10928 (G, UC); Golden City, *E. L. Greene* 62 (G); Georgetown, *M. E. Jones* 836 (NY); Colorado Territory, *C. C. Parry* in 1872 (NY); Twin Lakes, *I. W. Clokey* 3529 (NY, UI, F); Tolland, *L. O. Overholts*, July 3, 1914 (NY); Ouray, *Underwood & Selby* 19,130 (NY); near Lyons, *E. L. Johnston* 694 (G); Fraser, *Johnston & Hedgecock* 678 (G, UC); Wolf Creek Pass, San Juan Mts., Mineral Co., *C. B. Wolf* 3038 (G); Manitou, *M. A. Carleton* 418 (UI); Bosworth's Ranch, *C. S. Crandall* 1147 (G, UI); St. Elmo, Chaffee Co., *R. C. Rollins* 1380 (NY, UI); Pine River, *Mrs. F. Stone* 507 (NY). NEW MEXICO: Ute Park, Colfax Co., *P. C. Standley* 14410 (G, F); Mogollon Mts., Catron Co., *C. B. Wolf* 2635 (G); *H. H. Rusby* 59 (NY, F); Santa Fé, *A. A. & E. Gertrude Heller* 3643 (NY, F, G, UI); Cloudcroft, Sacramento Mts., Otero Co., *E. O. Wooton*, July 18, 1899 (NY); White Mountains, Lincoln Co., *E. O. Wooton* 302 (NY, UI, UC); Middle Fork of the Gila, Mogollon Mts., Socorro Co., *E. O. Wooton*, Aug. 5, 1900 (NY); Redstone, *A. Isabel Mulford* 868 (NY, UI); *A. Fendler* 88 (NY, F, G); Pecos River National Forest, *P. C. Standley* 4013, 4563 (NY, G).

Geranium Richardsonii was first described by Sir William Jackson Hooker as *G. albiflorum* on the basis of specimens collected by Thomas Drummond in the Rocky Mountains of Canada. Hooker's name, published in the *Flora Boreali-Americana* in 1830[1], unfortunately had been antedated by *G. albiflorum*

[1] See B. Daydon Jackson, Bibliographical Notes, in Bull. Herb. Boissier i. 298 (1893) for verification of this date.

Ledeb.[1], an Asiatic species, in 1829. This necessitated the new name *G. Richardsonii* Fisch. & Trautv. for the western North American white-flowered plant. *Geranium Richardsonii* has the most extensive range of any North American species of this genus. It extends from northern British Columbia to New Mexico and California. It has been reported from Cumbre Trojes, District of Temascaltepec, Mexico, by A. A. Bullock (Kew Bulletin 1937: 504. 1938). This is apparently a new southern record. It shows small variations, such as differences of size of flowers and leaves, slenderness of habit, and quantity of indument on various parts of the plant. In alpine situations in the southern part of its range the plants are often much smaller and are frequently cespitose. None of these slight variations appears to have any nameworthy taxonomic significance. The petals are almost always milk-white with pink or purple veins, occasionally varying to pinkish or rose.

The name *G. gracilentum* Greene has been relegated to synonomy under *G. Richardsonii*. The circumstances of the original publication of *G. gracilentum* were rather peculiar. The name was first published in 1906 in Rydberg's *Flora of Colorado*, but no description was given, and the few characters cited were merely part of the key. Eleven years later, Rydberg (1917) put *G. gracilentum* into synonomy under *G. Richardsonii*. In the *Flora of Colorado* the only character relied upon to distinguish *G. gracilentum* from *G. Richardsonii* is the appressed pubescence of the lower part of the stem, the statement in the key being that *G. Richardsonii* has a glabrous stem.

Examination of a series of specimens shows conclusively that *G. loloense* St. John is clearly identical with the common, widely distributed, white-flowered, western North American *G. Richardsonii*. In discussing the relationship of *G. loloense*, St. John compared it with *G. nervosum* Rydb. [i. e., *G. strigosius*], and pointed out several quantitative differences, but apparently overlooked the fact that Rydberg in 1901 had already outlined a similar segregation of species when he separated "*G. nervosum*" from *G. Richardsonii*.

8. G. **concinnum** sp. nov. Perennis, caudice lignoso saepius singulo foliorum basibus stipulisque marcescentibus squamato;

[1] Ledebour, C. F., Icones Plant. Ross. i. 6, *t. 18* (1829).

caulibus singulis vel paucis, erectis, gracilibus, minute retrorso-pubescentibus vel subglabris, 10–50 cm. longis; foliis basalibus subrosulatis, petiolo 8–20 cm. longo, minute retrorso-pubescente vel subglabro; lamina 2–7 cm. lata, reniformi vel pentagona, profunde 5–7-partita, laciniis rhombeis profunde incisis, lobis lanceolatis vel ovalibus utrinque minute adpresseque pubescentibus; foliis caulinis paucis, minoribus, brevius petiolatis caeterum cum basalibus congruentibus; stipulis lanceolatis, puberulis, 4–7 mm. longis; inflorescentia terminali, laxa, gracili, pedunculis saepius facie scaposis, 5–11 cm. longis, minute glanduloso-puberulis, pedicellis 2-jugis, 2.5–11 cm. longis, sub fructu erectis, sat conferte brevi-glandulosis trichomatibus glandulosis luteis vel translucentibus ornatis; sepalis 6–8 mm. longis, ovatis vel lanceolatis, mucrone 1.5–2 mm. longo; petalis 10–15 cm. longis, anguste obovatis, obtusis, integris, pallide violaceis vel roseis, intus ad medium vel tertium superum pilosis; filamentis ad tertium inferum ciliatis; columna stylari evoluta 2–2.5 cm. longa, glanduloso-puberula; stylodiis 4–5 mm. longis; carpidiis 4–5 mm. longis, pubescentibus, secus dorsum glandulosis; seminibus ca. 3 mm. longis, minute reticulatis.

Perennial, the woody, usually simple caudex covered with brownish marcescent scale-like leaf-bases and stipules; stems solitary or few, erect, slender, finely retrorsely pubescent to nearly glabrous, 10–50 cm. tall; basal leaves somewhat tufted, the petioles 8–20 cm. long, finely retrorsely pubescent to nearly glabrous; blades 2–7 cm. broad, reniform to pentagonal, deeply 5–7-parted, the segments rhombic, deeply incised with lanceolate to oval lobes, finely appressed-pubescent on both surfaces; cauline leaves few, smaller, shorter-petioled, but of similar texture and indument; stipules lanceolate, puberulent, 4–7 mm. long; inflorescence terminal, lax, slender, the peduncles often scape-like, 5–11 cm. long, finely glandular-puberulent; pedicels paired, 2.5–11 cm. long, erect in fruit, rather densely short-glandular, the trichomes tipped with yellowish or translucent glands; sepals 6–8 mm. long, oval or lanceolate, the mucro 1.5–2 mm. long; petals 10–15 mm. long, narrowly obovate, obtuse, entire, pale lavender to pink, pilose inside one-half to three-fourths their length; filaments ciliate one-third their length; mature stylar column 2–2.5 cm. long, glandular-puberulent; stylodia 4–5 mm. long; carpel-bodies 4–5 mm. long, pubescent, glandular along the keel; seeds about 3 mm. long, minutely reticulate.—Type Locality: Kern River, Tulare Co., California. A montane species occurring at altitudes of 7000–8000 feet in central and southern California. Specimens examined: California: Kern River, *Culbertson* 4454 (G, type; NY, UC); Bear Valley, San Bernardino Co., *S. B. Parish* 1806 (G, F, UC); Frazier Mt., *Dudley & Lamb* 4536 (UC), *H. M. Hall* 6602 (UC);

Olancha Mountain, Tulare Co., *Hall & Babcock* 5225 (UC); Eagle Creek, Mono Co., *T. M. Hendrix* 349 (UC).

Geranium concinnum is undoubtedly closely related to *G. Richardsonii* on the one hand and to *G. californicum* on the other, constituting in certain respects an entity somewhat intermediate between those two species. It differs from *G. Richardsonii* in its pale lavender or pink petals, its longer stylodia, and in having the trichomes of the pedicels tipped with yellowish or translucent glands. From *G. californicum* it differs in its shorter stylodia, and the puberulence of the stem, petioles, and blades. Apparently it bears about the same relationship to *G. californicum* as does *G. viscosissimum* to *G. strigosius*, or *G. eremophilum* to *G. caespitosum*.

It is apparent that *G. Richardsonii*, *G. concinnum*, and *G. californicum* constitute three closely related species that are distinguished by small but rather definite morphological characters. Their phytogeography and ecological relationships are as yet not too well defined. Further study in the herbarium and especially in the field will be necessary before this perplexing group of species will have been elucidated to the full satisfaction of Californian botanists.

We are giving this plant the specific name *concinnum* on account of its neat and delicate appearance.

9. G. **californicum,** nom. nov. Perennial with a stout, elongate, woody caudex; stems solitary or 2 or 3 and more or less tufted, erect or spreading, 20–70 cm. long, sparsely villous, the scattered trichomes on the lower part of the stem 1–2 mm. in length; upper part of stem sparsely pilose, and with scattered short glandular trichomes; petioles of the basal leaves 5–25 cm. long, sparsely villous; blades 3–8 cm. broad, thin, orbicular to pentagonal in outline, usually 5-parted, the divisions cuneate or rhombic with the smaller lobes acute; upper surface finely strigose, paler and rather copiously hirsute beneath especially along the somewhat prominent veins; cauline leaves similar but smaller; stipules lanceolate, 6–12 mm. long, puberulent or more or less pilose; inflorescence axillary or terminal, sometimes arising directly from the caudex; pedicels in pairs, or sometimes in threes, 1–12 cm. long, copiously yellowish glandular-villosulous and with longer glandless trichomes; sepals oval, 3-veined, thin-margined, 6–9 mm. long, pilose, a few of the hairs gland-tipped; mucro 1.5–2 mm. long; petals narrowly obovate, obtuse, entire, 12–16 mm. long, rose-pink or white, with dark veins, pilose about

half their length; filaments sparsely pilose about one-fourth to one-half their length; mature stylar column 2–2.5 cm. long, rather copiously glandular-villosulous; stylodia 6–9 mm. long; carpel-bodies about 4–5 mm. long, sparsely glandular-hirsute; seeds about 3 mm. long, faintly reticulate.—*Geranium incisum* sensu Brewer & Watson, Bot. Calif. i. 94 (1880), ex p.; Hall & Hall, Yosemite Fl. 148 (1912). Non Andrews (1799), nec Nutt. ex Torr. & Gray (1838). *Geranium leucanthum* Small in N. Am. Fl. xxv. 18 (1907); Knuth in Engler, Pflanzenr. iv (129). 116 (1912); Munz, Man. So. Calif. Bot. 275 (1935), ex p. Non Grisebach in Goett. Abh. xix. 103 (1874), nec Andrz. ex Trautv. in Act. Hort. Petrop. viii. 177 (1883), nom. nud. *Geranium caespitosum* sensu Jepson, Man. Fl. Pl. Calif. 590 (1925), Fl. Calif. ii. 404 (1936), ex p. Non James apud Gray, 1849.—Meadows and open forests, 4000–8000 feet altitude, middle and southern California.—TYPE LOCALITY: Pineridge, Fresno Co., California.—Specimens examined: CALIFORNIA: Pineridge, Fresno Co., *Hall & Chandler* 224 (NY, TYPE of *G. leucanthum* Small; UC); San Bernardino Mts., Yosemite Valley, *J. B. Lembert*, June 1894 (NY); San Jacinto Mts., *H. E. Hasse*, July 2, 1892 (NY); Mariposa Co., *A. Wood* in 1866 (NY); Yosemite Valley, *John Torrey*, in 1872 (NY), *LeRoy Abrams* 4386 (NY, G, UC), *W. H. Brewer* 1674 (G), *H. M. Hall* 9234 (UC); Sierra National Forest, *LeRoy Abrams* 4982 (NY, G); Sierra Nevada Mts., Fresno Co., *F. J. Smiley* 590 (G); Mather, Tuolumne Co., *H. L. Mason* 2139 (G, UC), *H. M. Hall* 11813, 11814 (UC); Tuolumne Co., *E. R. Drew*, July 3, 1887 (UC); North Fork, Madera Co., *R. Bacigalupi* 2272 (UC); Stanislaus National Forest, Tuolumne Co., *I. L. Wiggins* 6810 (UC); Salmon Creek, Tulare Co., *Hall & Babcock* 5147 (UC); Greenhorn Range, Kern Co., *Hall & Babcock* 5048 (UC).

This species has been mistaken for the Rocky Mountain *G. caespitosum*, and for *G. strigosius* [i. e., *G. incisum* of authors], a species which enters California only in the extreme northern part. It has also been called *G. Richardsonii*. In 1907, Small recognized its distinctness from that white-flowered species, giving it the name *G. leucanthum* in allusion to its pale flowers which were erroneously said to be white. Small's name cannot be maintained because that binomial was published by Grisebach in 1874 for a plant of Argentina. We are therefore renaming this species for California, where it is endemic.

Hall & Hall (1912, p. 148) published the following field-notes about this species, which they referred to as *G. incisum:* "This pink-flowered geranium, which grows from thick, perennial

roots, is a pleasing and not uncommon inhabitant of the Yellow Pine Belt. In exposed places the plants are small and very hairy, in the shade they become taller and smoother. Occasionally they produce albino flowers and can then scarcely be distinguished from the next species." [i. e., *G. Richardsonii*].

10. GERANIUM **attenuilobum,** sp. nov. Perennis, caudice ut videtur simplici; cauli solitario, erecto conferte glanduloso-puberulo; foliis basalibus ignotis, caulinorum petiolo glanduloso, lamina 2.5–6 cm. lata, supra pilosula, pallidiore, subtus secus venas glandulosa, 5-partita, laciniis irregulariter 3-lobis, lobis lanceolatis, acuminatis, lobulo mediano segmenti cujusvis quam caeteris longiore abrupte attenuato vel caudato, cauda 4–6 mm. longa; stipulis lanceolatis, 5–15 mm. longis, dense puberulis, ciliatis; inflorescentia terminali; pedunculis 3–9 cm. longis, glanduloso-puberulis, pedicellis 1–5 cm. longis, sat conferte glanduloso-villosulis, primum reflexis dein sub fructu erectis; sepalis ovalibus, 8–11 mm. longis, glanduloso-pubescentibus, mucrone 2.5–3 mm. longo; petalis obovatis, apice retusis, 12–16 mm. longis, saturate roseis ad medium pilosis; filamentis ad medium vel ad tertium superum pilosis; stylodiis 5 mm. longis; columna stylari evoluta 2.5–3.5 cm. longa, sat conferte glanduloso-pubescente; carpidiis maturis seminibusque haud visis.

Perennial with (probably) a simple caudex; stem solitary, erect, densely glandular-puberulent; basal leaves not seen; petioles of the cauline leaves glandular, blades 2.5–6 cm. broad, pilosulous above, paler and glandular along the veins beneath, 5-parted, the divisions unequally 3-lobed, each lobe lanceolate, acuminate, the middle lobe of each segment longer than the others and abruptly attenuate or caudate, the caudate tips 4–6 mm. long; stipules lanceolate, 5–15 mm. long, densely puberulent, ciliate; inflorescence terminal; peduncles 3–9 cm. long, glandular-puberulent; pedicels 1–5 cm. long, rather copiously glandular-villosulous, reflexed and bent upward in fruit; sepals oval, 8–11 mm. long, glandular-pubescent, the mucro 2.5–3 mm. long; petals obovate, retuse at the apex, 12–16 mm. long, rose-purple, pilose one-half their length; filaments pilose one-half to two-thirds their length; stylodia 5 mm. long; mature stylar column 2.5–3.5 cm. long, rather copiously glandular-pubescent; mature carpels and seeds not seen.—In mountain valleys of Modoc Co., California. TYPE LOCALITY: Jess Valley, Warner Mountains, Modoc Co., California. Specimens examined: CALIFORNIA: Jess Valley, Warner Mountains, Modoc Co., July 24, 1925 *F. H. Frost* 113 (G, TYPE; UC).

This species differs from the other large-flowered North American geraniums by the unique attenuation of the leaf-lobes.

Its loose inflorescence with the several-flowered peduncles points to a probable alliance with *G. strigosius*, but its abundantly pilose petals indicate also a possible affinity with *G. californicum*. We have seen only one collection of *G. attenuilobum*. This consists of the inflorescence and the upper part of the stem. We are giving this plant the specific name *attenuilobum* in allusion to the distinctive attenuate lobing of the upper leaves.

11. G. MARGINALE Rydb. Perennial with branched caudex; stems 10–40 cm. tall, erect or ascending, finely retrorsely pubescent; petioles of the basal leaves 8–18 cm. long, puberulent or finely pubescent; blades 2–3.5 cm. broad, reniform to pentagonal, strigillose or puberulent on both surfaces, 5-parted, the divisions rhombic to obovate, 3-toothed near the apex, the ultimate lobes lanceolate or ovate, acute, with acute sinuses; cauline leaves similar, but usually smaller; stipules triangular-lanceolate, 2–7 mm. long, puberulent, ciliolate; inflorescence cymose, spreading, terminal; peduncles 1–3.5 cm. long; pedicels 1–3 cm. long, more or less retrorsely puberulent with non-glandular trichomes; petals narrowly oblanceolate or narrowly obovate, obtuse, entire, 10–12 mm. long, pale pink or lavendar, pubescent within about one-fourth their length or less, otherwise glabrous; sepals 7–9 mm. long, oval to shortly lanceolate, puberulent to nearly glabrous, narrowly hyaline-margined, 3-veined, the mucro 1–2 mm. long; filaments ciliate one-third their length; mature stylar column puberulent to shortly pilosulous, non-glandular, 1.5–2 cm. long; stylodia 3–4 mm. long; carpel-bodies 4 mm. long; seeds 3 mm. long, faintly reticulate.—Rydberg ex Hanks & Small in N. Am. Fl. xxv. 16 (1907), Fl. Rocky Mts. 533 (1917).—Uplands of Colorado and Utah.—TYPE LOCALITY: Aquarius Plateau, at the head of Poison Creek, Utah. Specimens examined: UTAH: Aquarius Plateau, *L. F. Ward*, Aug. 11, 1875 (G), *Rydberg & Carlton* 7401 (NY, TYPE; G), 7408, 7411, 7415, 7446 (NY); Milford, *F. W. Hill* 154 (UI).

This species occupies a position between *G. caespitosum* and *G. Fremontii*. The glandless indument is like that of the former; the shorter stylodia, and the small amount of pubescence on the petals place it near *G. Fremontii*.

12. G. COWENII Rydb. Perennial with a branched, woody caudex; stems few, tufted, erect, 20–40 cm. tall, the lower internode shortly villous with non-glandular, whitish, somewhat retrorse trichomes about 1 mm. long; petioles of the basal leaves 7–17 cm. long, loosely villosulous with whitish non-glandular trichomes; blades thickish, pentagonal or roundish in outline, 3–6 cm. broad, strigillose on both surfaces, deeply 5-parted, the

divisions rhombic-obovate, deeply 3–5-lobed, the lobes acute; basal sinus acutish; stipules lanceolate, attenuate, villosulous, non-glandular, 5–10 mm. long; cauline leaves similar to the basal ones, smaller, shorter-petioled or sessile; inflorescence terminal, the peduncles erect, 5–15 cm. long, sparsely pilosulous, each 2–3-flowered; pedicels more or less pilosulous with non-glandular trichomes, sometimes slightly glandular in the bud stage, 3–5 cm. long, becoming reflexed and bent upward in fruit; sepals 8–11 mm. long, oval-lanceolate, acutish, narrowly hyaline-margined, puberulent, not at all glandular; mucro 1–2 mm. long; petals lavendar to pale rose-purple, obcordate to broadly obovate, 1.5–2 cm. long, pilose inside about one-third their length; filaments ciliolate about one-third their length; mature stylar column 2–2.5 cm. long, rather closely short-hispidulous, scarcely glandular; stylodia 5–7 mm. long; carpel-bodies ellipsoid, 5 mm. long, pubescent; seeds reticulate.—Fl. Colorado, Bull. 100, Colorado Agr. Exp. Sta. 218 (1906); Hanks & Small in N. Am. Fl. xxv. 16 (1907); Knuth in Engler, Pflanzenr. iv (129). 103 (1912); Rydberg, Fl. Rocky Mts., 532 (1917).—Canyons and mountainsides, Colorado. TYPE LOCALITY: Rist Canyon, Colorado. Specimens examined: COLORADO: Horsetooth Gulch, *C. S. Crandall*, July 15, 1897 (NY); Turkey Creek, *Rydberg & Vreeland* 5917 (NY); Placer Gulch, *Rydberg & Vreeland* 6639 (NY); Rist Canyon, *W. F. Marshall* 1157 (NY, TYPE).

Geranium Cowenii, which is apparently endemic to Colorado, is evidently a member of the "caespitosum" group. and is probably nearly related to *G. marginale*. From *G. Fremontii* it is effectively separated by its somewhat larger flowers, longer stylodia, and non-glandular pubescence.

13. G. PARRYI (Engelm.) Heller. Perennial with branched caudex; stems 10–40 cm. tall, tufted, erect, the lower internode and the petioles of the basal leaves, more or less glandular-pilose or glandular-puberulent, with some longer, scattered, whitish, spreading, non-glandular trichomes; petioles of the basal leaves 8–20 cm. long; blades thickish, 2–7 cm. broad, strigose on both surfaces, especially on the veins, reniform to pentagonal in outline, deeply 3–7-parted, the divisions incised to lobed, the lobes rhombic, usually 3-parted; margins glandular-ciliate; basal sinus broad, often truncate; cauline leaves similar, smaller; stipules lanceolate, 7–12 mm. long, glandular-puberulent to glandular-villous; inflorescence spreading-cymose; peduncles 2–8 cm. long, axillary or terminal, glandular-villous with trichomes 1–1.5 mm. long; pedicels usually paired, sometimes in threes, 1.5–5 cm. long, becoming reflexed and bent upward in fruit, rather copiously glandular-villosulous, the straight, spreading

trichomes 0.5–1 mm. long, tipped with yellowish or translucent glands, and often with an inconspicuous underlying pubescence of short, curved, whitish, non-glandular trichomes; sepals 6–10 mm. long, oval, glandular-villosulous, the mucro 0.5–1.5 mm. long; petals emarginate, 1.2–1.5 cm. long, pale to deep rose-purple, pilose about one-fourth their length; mature stylar column 1.5–3 cm. long, densely glandular-pubescent; stylodia 5–6 mm. long; carpel-bodies 4–5 mm. long, hispid with trichomes 1–2 mm. long; seeds 3–3.5 mm. long, reticulate.—Cat. N. Am. Pl. ed. 2. 7 (1900); Hanks & Small in N. Am. Fl. xxv. 14 (1907); Coulter & Nelson, New Man. Rocky Mt. Bot. 303 (1909); Knuth in Engler, Pflanzenr. iv (129) 100 (1912); Rydberg, Fl. Rocky Mts. 532 (1917). *Geranium Fremontii* var. *Parryi* Engelm. in Am. Journ. Sci. ser. 2. xxxiii. 45 (1862). *Geranium Richardsonii* var. *intermedia* O. Kuntze, Rev. Gen. Pl. i. 93. 1891. *Geranium Pattersonii* Rydberg, Bull. Torr. Bot. Club, xxix. 242 (1902); Hanks & Small in N. Am. Fl. xxv. 14 (1907); Knuth in Engler, Pflanzenr. iv (129). 100 (1912); Rydberg, Fl. Rocky Mts. 532 (1917). *Geranium Fremontii Parryi* Tidestrom & Kittell, Fl. Arizona & New Mexico, 131 (1941).—Not uncommon on gravelly slopes or in rocky soil, on mountainsides, in canyons, or foothills, at altitudes of 7000 to 10,000 feet, southern Wyoming, Colorado, Utah, and Arizona. TYPE LOCALITY: "From the headwaters of Clear Creek, and the alpine ridges lying east of 'Middle Park', Colorado Territory." TYPE collected in 1861 by C. C. Parry. Specimens examined: WYOMING: Jelm, Albany Co., *Aven Nelson* 8061 (G, NY). COLORADO: Colorado Springs, *M. E. Jones* 150 (NY); Broadmoor, *A. Isabel Mulford*, Sept. 1, 1892 (NY); Pike's Peak, *T. F. Allen* in 1894 (NY); Manitou, *F. Clements* 187 (NY); Idaho Springs, *C. L. Shear* 3282 (NY); Rollinsville, *L. O. Overholtz*, July 8, 1913 (NY); Watertown, Douglas Co., *Osterhout & Clokey* 4196 (NY, F, UC); Gray's Peak, *P. A. Rydberg*, Aug. 23, 1895 (NY, type of *G. Pattersonii* Rydb.); North Cheyenne Canyon, near Pike's Peak, *E. A. Bessey*, July 14, 1896 (NY); foot of Pike's Peak, *C. L. Shear* 3702 (NY); Ute Pass, *C. L. Shear* 3696 (NY); Eldora to Baltimore, Gilpin Co., *F. Tweedy* 5537 (NY); no definite locality, *Herb. Otto Kuntze* 3024 (NY); Buffalo Creek Canyon, *H. H. Rusby*, Sept. 14, 1909 (NY); near Empire, *H. N. Patterson* 176, 177, (NY, G, F, UC); headwaters of Clear Creek east of Middle Park, *C. C. Parry* 113 (TYPE, NY; G); Artist's Glen. Pike's Peak, *H. M. Hall* 10927 (UC, G); Brookvale, Clear Creek Co., *J. R. Churchill*, June 19, 1918 (G); mts. of Colorado, *W. M. Canby*, Aug. 1871 (G); Larkspur, Arapahoe Co., *R. C. Rollins* 1194 (UI, G); Crescent, Gilpin Co., *H. M. Hall* 10425 (UC); Sierra Mojado, *T. S. Brandegee*, June 22, 1877 (UC); Trails End, *Aven Nelson* 10112 (UC). UTAH: near Mirror Lake, Kane Co., *W. S.*

Boyle Z375 (UC). ARIZONA: Clark's Valley, *H. H. Rusby*, Aug. 4, 1883 (NY); Trumbull, *E. Palmer* 68 (G).

This species has an obvious affinity with *G. Fremontii* and by some authors has been regarded as a variety of it. It may be distinguished at once from *G. Fremontii* by the glandular-villous indument of the stem and petioles, while the stem and petioles of *G. Fremontii* are short-pubescent, with non-glandular trichomes.

We are reducing *G. Pattersonii* to synonomy under this species because it occupies the same geographical range and habitat, and we can find no reliable taxonomic characters to distinguish it. The leaf-characters used originally to separate *G. Pattersonii* from *G. Parryi* are intangible and inconstant. However, it may be worth noting that the pubescence of the petioles of the basal leaves, and the lower internode of the stems of some of the specimens determined by Rydberg as *G. Pattersonii* is somewhat less glandular than in most specimens of *G. Parryi*.

14. G. FREMONTII Torr. ex Gray. Perennial with branched caudex; stems 20–50 cm. tall, tufted, erect at first, later decumbent and divaricately branched, the lower internode sparsely retrorsely strigose to nearly glabrous; petioles of the basal leaves 7–30 cm. long, finely retrorsely pubescent with whitish, glandless trichomes; blades 3–8 cm. broad, reniform to pentagonal, 5–7-parted, the lobes oblong, acute, strongly veined, sparsely appressed-pubescent on both surfaces, or sometimes glandular below; cauline leaves similar, smaller, the petioles glandular-pubescent, as are frequently the uppermost leaves; blades 2–5 cm. broad, 3–5-parted; stipules lanceolate, 5–7 mm. long, puberulent, more or less glandular, ciliate; inflorescence axillary or terminal; peduncles 1.5–3 cm. long; pedicels in pairs (rarely more than 2), usually 2–3 cm. long, rather densely glandular-villosulous, the trichomes short, spreading, yellowish-tipped; sepals 7–12 mm. long, oval-lanceolate, the mucro 1 mm. long, the outer ones glandular; petals 1–1.5 cm. long, obovate, emarginate, pale purple, dark-veined, rarely white, pilose about one-fourth their length; filaments ciliate one-fourth their length; mature stylar column about 3 cm. long, densely glandular-pubescent; stylodia 4–5 mm. long; carpel-bodies 5 mm. long, sparingly pubescent or hispid, at least along the keel, the trichomes about 1 mm. long; seeds 3–4 mm. long, reticulate.—In Pl. Fendler. [Mem. Am. Acad. ser. 2. iv.] 26 (1849); Engelmann in Gray, op. cit., 27 (1849); Trelease in Mem. Boston Soc. Nat. Hist. iv. 75 (1888), and in Gray, Syn. Fl. i. 359 (1897); Howell,

Fl. Nw. Am. 106 (1897); Hanks & Small, N. Am. Fl. xxv. 15 (1907); Coulter & Nelson, New Man. Rocky Mt. Bot. 303 (1909); Knuth in Engler, Pflanzenr. iv (129). 101 (1912); Wooton & Standley, Contr. U. S. Nat. Herb. xix. 381 (1915); Rydberg, Fl. Rocky Mts., 532 (1917); Tidestrom, Contr. U. S. Nat. Herb. xxv. 338 (1925); Tidestrom & Kittell, Fl. Arizona & New Mexico, 131 (1941). *Geranium furcatum* sensu Hanks in Hanks & Small, N. Am. Fl. xxv. 16 (1907); Knuth in Engler, Pflanzenr. iv (129). 104 (1912); Wooton & Standley, Contr. U. S. Nat. Herb. xix. 381 (1915). Non Kit. in Linnaea, xxxii. 567 (1863), nec Schur, Enum. Pl. Transs. 138 (1866). *Geranium caespitosum* sensu Hanks & Small, in N. Am. Fl. xxv. 15 (1907); Rydberg, Fl. Rocky Mts., 532 (1917); Tidestrom, Contr. U. S. Nat. Herb. xxv. 337 (1925). Non Gray (1849). *Geranium caespitosum gracile* Nels. & Macbride, Bot. Gaz. lv. 376 (1913); *Geranium atropurpureum* var. *furcatum* Kearney & Peebles, Journ. Washington Acad. Sci. xxix. 485 (1939).—Canyons, plains, and foothills, 5000–10000 feet altitude, in Wyoming, Colorado, New Mexico and Arizona. TYPE LOCALITY: "Bottom lands of the Mora River, among shrubs; August. (Also in the Raton Mountains, *Lieut. Abert*, and probably farther north and west by Col. Fremont.)." Representative specimens: WYOMING: Camp Crawford, *Mrs. Joseph Clemens*, Aug. 6, 1908 (G, F); Chug Creek, Albany Co., *Aven Nelson* 7330 (NY, G, UI); Albany, *W. G. Solheim* 242 (UI); Laramie, *B. C. Buffum*, June 1892 (UI). UTAH: Willow Springs, *E. H. Graham* 9563 (G); Bryce Canyon, *W. S. Boyle* Z392 (UC); Panguitch Lake, *Goodman & Hitchcock* 1587 (NY, US, F, G, UC). COLORADO: Sangre de Christo Creek, *Rydberg & Vreeland* 5916 (NY); Sand Creek Pass, *C. F. Baker*, Aug. 3, 1897 (NY); Fort Collins, *C. S. Crandall*, July 15, 1897 (NY), *Mildred E. Mathias* 363 (NY), *G. E. Osterhout* 6315 (G), *C. F. Baker*, May 24, 1896 (NY); Wooton, *H. H. Rusby*, Sept. 11, 1909 (NY); Gunnison, *R. C. Rollins* 1333 (NY, UI); Twin Lakes, *I. W. Clokey* 3584 (NY, G, UI, UC); Allenspark, *Johnston & Hedgecock* 724 (NY); Thompson Canyon, *E. L. Johnston* 704 (NY); Boulder, *F. Tweedy* 5017 (NY); Sheep Canyon, *F. E. & Edith S. Clements* 90 (NY, G); Larimer Co., *J. H. Cowen* 99 (UC, NY), 112 (G), *G. E. Osterhout* 6312 (UC, G); Estes Park, *Mrs. R. L. Russell* in 1916 (G); La Veta, *C. S. Crandall*, Aug. 21, 1897 (NY); Gould Creek, Pike's Peak Forest Reserve, *J. C. Blumer*, Aug. 12, 1903 (G, F); North Elk Canyon, Rio Blanco Co., *W. C. Sturgis*, July 21, 1902 (G); Low Mts., n. Colorado, *Asa Gray* in 1872 (G); Como, *Miss E. L. Hughes* 47, 48 (G); Estes Park, *M. S. Baker* 4515b (UC). NEW MEXICO: Ceballa, *E. O. Wooton* 2875 (NY); Pinos Altos Mts., *E. L. Greene*, Aug. 23, 1880 (F); without definite locality, *Frémont* 42 (NY, G); Raton Mts., *Abert*, Aug. 7, 1846 (NY, TYPE; G). ARIZONA:

Flagstaff, *C. A. Purpus* 8096 (UC); Bekins Butte, *J. W. Toumey*, July 19, 1892 (UC); White Mts., *L. N. Goodding* 655 (NY); San Francisco Mt., *C. B. Wolf* 3165 (G); Grand Canyon of the Colorado, *T. F. Allen*, Aug. 1897 (NY, type of *G. furcatum* Hanks; UC).

Geranium Fremontii is a characteristic plant of hillsides and canyons of the southern Rocky Mountain region. It has been named by several authors *G. caespitosum*, but as shown in the discussion in this paper, following the description of *G. caespitosum* James, this is, of course, quite erroneous. *G. Fremontii* is much closer to *G. Parryi* than it is to *G. caespitosum*.

Geranium furcatum Hanks, described from specimens collected in the Grand Canyon of the Colorado, is evidently identical with *G. Fremontii*, and is therefore herein reduced to synonomy.

15. G. EREMOPHILUM Wooton & Standley. Perennial with a slender, branched caudex; stems tufted, slender, weak, divaricately branching, suberect or decumbent, 40–70 cm. long, finely retrorsely pubescent; petioles of the basal leaves 4–6 cm. long, finely retrorsely pubescent, the blades 2.5–4 cm. broad, pentagonal in outline, obtuse or truncate at the base, 3- or 5-lobed, the lobes rhombic, 3-toothed, acute, finely appressed-pubescent; cauline leaves smaller, thin, 3-lobed, generally halberd-shaped, sparingly appressed-pubescent above, the lower surface similar except for more or less retrorse pubescence on the veins; stipules attenuate-lanceolate, 2–10 mm. long, puberulent, ciliate; peduncles axillary, slender, 3–15 cm. long; pedicels paired, finely retrorsely pubescent and sometimes somewhat glandular, 1.5–3 cm. long; sepals 8–10 mm. long, oval-lanceolate, appressed-pubescent, not glandular, the mucro 1–2 mm. long; petals purplish pink, 1–1.5 cm. long, obovate, retuse, sometimes paler, pilose about half their length; mature stylar column 2.5–3 cm. long, appressed-pubescent or glandular-pubescent; stylodia 6–7 mm. long; carpel-bodies 4–5 mm. long, sparingly short-strigose; seeds about 3 mm. long, reticulate.—Wooton & Standley in Contr. U. S. Nat. Herb. xvi. 142 (1913).—Mountains of New Mexico and Arizona. TYPE LOCALITY: San Luis Mountains, New Mexico. Specimens examined: NEW MEXICO: San Luis Mts., *E. A. Mearns* 2142 (US, TYPE), 2194 (US); Redstone, *A. Isabel Mulford* 859 (NY); Fort Bayard Watershed, Grant Co., *J. C. Blumer* 29 (NY, G); Hot Springs, *F. H. Snow* (UC); Mogollon Mts., Socorro Co., *O. B. Metcalfe* 242 (NY); Organ Mts., Dona Ana Co., *Wooton & Standley*, Sept. 23, 1906 (US). ARIZONA: Luka-Chukai Mts., Apache Co., *Goodman & Lois B. Payson* 2785 (NY); White Mts., *L. N. Goodding* 1248 (NY); Flagstaff, *H. C. Hanson* A 194 (UI); Barnhart Pass, Matzatzal

Mts., Gila Co., *Rose E. Collom* 111 (NY); Chiricahua Mts., *J. W. Toumey* (G); Rincon Mts., *J. C. Blumer* 3305 (UC); Huachuca Mts., *L. N. Goodding* 356 (NY), *E. A. Mearns* 2601 (US); Apache Pass, *J. G. Lemmon* 524 (G).

This species is most closely related to *G. caespitosum*, from which it differs in having more or less glandular indument, at least on the pedicels. In discussing the relationship of *G. eremophilum* with its near allies, Wooton & Standley say ". . . near *G. Fremontii* and *G. caespitosum*, but is more slender, has paler, rather larger flowers, scarcely any glandular pubescence, and nearly glabrous leaves with broader, blunter segments." This analysis is amply supported by a close study of the holotype and abundant additional specimens from Arizona and New Mexico.

16. G. CAESPITOSUM James. Perennial with a woody, usually branched caudex; stems tufted, erect at first, later becoming procumbent or ascending, divaricately branched, and frequently rooting at the nodes, 10–90 cm. long, strigillose to pilosulous with glandless trichomes above, often rather copiously short-villous near base; petioles of the basal leaves 8–12 cm. long, pubescent; blades 2–5 cm. broad, orbicular to pentagonal in outline, finely appressed-pubescent on both surfaces, 5-parted, the lobes rhombic, each 3-parted; basal sinus broad, open; cauline leaves similar, 1–5 cm. broad, 3–5-parted, the 3-divided lobes divaricate, acute; stipules linear-lanceolate, acuminate, 2–10 mm. long, puberulent and ciliate; peduncles solitary, axillary, slender, pilosulous, 4–15 cm. long; pedicels paired, 2–3 cm. long, becoming reflexed in fruit, retrorsely pilosulous or puberulent with non-glandular trichomes; sepals 8–12 mm. long, oval, 3-veined, acute or obtuse, hyaline-margined, ciliate and sparsely appressed-pubescent, non-glandular; mucro 1–2 mm. long; petals 12–18 mm. long, obovate, deep rose-purple, sometimes paler, pilose inside about half their length; mature stylar column 2.5–3 cm. long, sparsely puberulent; stylodia 5–8 mm. long; carpel-bodies 4–5 mm. long, sparsely short-strigose, with an underlying puberulence; seeds 3–4 mm. long, reticulate.—James apud Gray, Plantae Fendl. [Mem. Am. Acad. ser. 2. iv.] 25 (1849); James in Long's Exped. Rocky Mts. ii. 3 (1823), as "*G. caespitose*"; Torr. in Ann. Lyceum Nat. Hist. New York, ii. 173 (1828); Torr. & Gray, Fl. N. Am. i. 207 (1838); Walpers, Rep. Bot. Syst. i. 450 (1842); Engelm. in Gray, Mem. Am. Acad. ser. 2, iv. 27 (1849), in Plantae Wright. ii. 25 (1852); Trelease in Mem. Boston Soc. Nat. Hist. iv. 75 (1888), and in Gray, Syn. Fl. i. 359 (1897); Coulter & Nelson, New Man. Rocky Mt. Bot. 303 (1909); Knuth in Engler, Pflanzenr. iv (129). 102 (1912). *Geranium gracile* sensu Engelm. in Gray, Mem. Am. Acad. n. s. iv. 27

(1849); Hanks & Small in N. Am. Fl. xxv. 16 (1907); Tidestrom & Kittell, Fl. Arizona & New Mexico, 131 (1941). Non Ledeb. ex Nordm. in Bull. Sc. Acad. St. Petersb. ii. 314 (1837), nec Schrenk in Bull. Phys. Math. Acad. St. Petersb. iii. 308 (1845). *Geranium caespitosum* f. *albiflorum* Cockerell, Science Gossip, xxv. 188 (1899). *Geranium atropurpureum* Heller, Bull. Torr. Club, xxv. 195 (1898); Knuth in Engler, Pflanzenr. iv (129). 103 (1912); Wooton & Standley, Contr. U. S. Nat. Herb. xix. 380 (1915); Rydberg, Fl. Rocky Mts. 533 (1917); Tidestrom, Contr. U. S. Nat. Herb. xxv. 337 (1925).—Hillsides, canyons, or open woods, Colorado and western Texas to New Mexico, Arizona, and Utah; Mexico. TYPE LOCALITY: "Santa Fé Creek, near irrigating ditches, at the foot of mountains; May to July; and six miles east of the Mora River; August."—Representative specimens: COLORADO: Norwood Hill, San Miguel Co., *E. P. Walker* 407 (NY, G); Artist's Glen, Minnehaha, *J. Arthur Harris* C21409 (NY); Beaver Creek Reservoir, Rio Grande Co., *R. C. Rollins* 1491 (NY, G, UI); Rio Blanco Creek, Archuleta Co., *R. C. Rollins* 1543 (NY, G, UI); Ouray, *Underwood & Selby* 152, 152a (NY), *C. F. Baker* 763 (NY, G); Arboles, *C. F. Baker* 448 (NY, F, G); Paradox, Montrose Co., *E. P. Walker* 217 (G); Pagosa Springs, *Susan Delano McKelvey* 4716 (G); Dolores, Montezuma Co., *C. S. Crandall* 111 (G); Pueblo, *R. W. Woodward*, June 1883 (G); Horsefly Creek, Montrose Co., *E. B. & Lois B. Payson* 3908 (G, UC); Mancos, *Baker, Earl & Tracy* 407 (F, NY, G, UC). TEXAS: McKittrick Canyon, Guadalupe Mts., Culberson Co., *Moore & Steyermark* 3486 (NY, UC, G); Limpia Canyon, *G. C. Nealley* 65 (F); Livermore Peak, Davis Mts., Jeff Davis Co., *Ferris & Duncan* 2550 (NY), *E. J. Palmer* 30730A, 34371 (NY), *Mary S. Young*, September 10, 1918 (G, UC, UI). NEW MEXICO: Santa Fé, *A. A. & E. Gertrude Heller* 3723 (NY, G, UI, type collection of *G. atropurpureum* Heller), *F. S. Earle* 81 (NY); Fort Bayard, *A. Isabel Mulford* 358 (NY, UI); Pinos Altos Mts., *A. Isabel Mulford* 760 (NY, UI); Whitman's Camp, *A. Isabel Mulford* 1243 (NY, UI); Cloudcroft, Sacramento Mts., Otero Co., *E. O. Wooton* 6753 (NY, G); Wheeler's Ranch, *E. O. Wooton*, July 11, 1906 (NY); White Mountain Peak, *E. O. Wooton*, July 6, 1895 (NY); Bartlett Ranch, *E. O. Wooton*, Sept. 3, 1913 (NY); White Mountains, Lincoln Co., *E. O. Wooton* 218 (NY, UC, UI); Burro Mts., *J. C. Blumer* 1835 (NY, F, G), Grant Co., *O. B. Metcalfe* 194 (NY, G, UI, UC); Copper Mines, *Thurber* 229 (NY, G); Las Vegas Hot Springs, *T. D. A. Cockerell* 58 (NY); Pecos River National Forest, *P. C. Standley* 4117 (NY, G); Ute Park, Colfax Co., *P. C. Standley* 14119 (NY); Trujillo Canyon, Gila Nat. Forest, *W. R. Chapline* 330 (NY); Balsam Park, Sandia Mountains, *Charlotte C. Ellis* 109 (NY); El Capitan Mts., *F. S. & Esther S. Earle* 201 (NY, UC); San Antonita, *J. M.*

Bigelow, Oct. 9, 1853 (NY, G); without locality, *C. Wright* 910 (NY, G); 6 mi. e. of Moro River, *A. Fendler* 89 (G, TYPE; NY, UC, F); Jemez Mts., Sandoval Co., *R. Goodwin*, Aug. 22, 1932 (G); High Rolls, Otero Co., *H. L. Viereck*, May, 1902 (G); Rociada, *J. E. Dandelin*, Aug. 1905 (G, UC); Rio Apache, *E. O. Wooton*, June 21, 1892 (UI). ARIZONA: Flagstaff, *L. F. Ward*, June 6, 1901 (NY), *D. T. MacDougal* 118 (NY, F, UC, G); Fossil Creek, *E. A. Mearns*, June 19, 1885 (NY); Pinedale, *Myrtle Zuck*, July 15, 1897 (NY); Santa Catalina, *J. A. Harris* C16392 (NY); Santa Catalina Mts., *C. G. Pringle* in 1881 (G); McNary, White Mts., *Goodman & C. L. Hitchcock* 1328 (NY, UC, G); Baboquivari Mts., *M. F. Gilman* 21 (NY); Painted Desert, Laguna Canyon, *W. N. Clute* 30 (NY, G, UI); Huachuca Mts., *L. N. Goodding* 776 (NY, G), *Lemmon* 2652 (G); Rincon Mts., *J. C. Blumer* 3305 (F, G); Coconino Nat. Forest, *G. A. Pearson* 298 (G); Mingus Mt., *W. W. Jones* 283 (G, UC). UTAH: Between Moab and Monticello, *Rydberg & Garrett* 9107 (NY); Monticello, *Rydberg & Garrett* 9163 (NY).

Because the publication in 1823 of this specific name by Dr. Edwin James was ambiguous, and since he had collected no specimen, the exact identity of James' plant is uncertain. All that James said about it is as follows: "*G. caespitose*, sub-erect, pubescent, sparingly branched above. Radical leaves reniform deeply 5–7-cleft. The flower is a little larger than that of *G. robertianum*, and similarly coloured, having whitish lines towards the base of the corrolla." When, in 1849 Gray described a species of geranium from the Rocky Mountains, he said, ". . . I am so confident that it is the species noticed and imperfectly characterized by Dr. James, that I venture to revive his name, which, unless thus identified, must ever remain appended to the genus as a doubtful species, since no specimens of it exist in the collections made by him in Long's Expedition." By this statement, and through the description of the species and the designation of a type locality, Dr. Gray appears to have securely established the entity *G. caespitosum* upon a firm and durable taxonomic foundation. Supporting evidence is supplied by a sheet in the Gray Herbarium, labeled Plantae Novo-Mexicanae, 6 miles east of Moro River, 18 Aug. 1847, *A. Fendler* 89, inscribed by Dr. Gray: "*G. caespitosum* James." Duplicate specimens are in the herbaria of the New York Botanical Garden and the University of California. However, dissenting opinion has been expressed by Trelease (1888) who makes this comment: "There is reason

to doubt whether James' plant was not really the preceding [i. e., *G. Fremontii*], for he did not collect south of Pike's Peak, while this species, as I understand it, is distinctively southern." It should be noted, however, that *G. caespitosum* ranges from New Mexico northward to Colorado and hence may occur in the region explored by James. A. A. Heller (1898) likewise expressed doubt as to the possibility that Gray's *G. caespitosum* could have been the plant observed in 1823 by James. The whole matter now appears to be rather inconsequential, because whatever may have been the identity of the plant observed by James, the fact remains that the name *G. caespitosum* was validated when Asa Gray gave it a proper description. It seems desirable therefore, to abide by Dr. Gray's interpretation. In fact, this conclusion was reached by Nelson & Macbride in 1913. They say[1]: "It is somewhat singular that there should be any misunderstanding in regard to *Geranium caespitosum* James. Admitting that the original printing of the name did not publish the species, Dr. GRAY'S diagnosis in Pl. Fendl. 25 and Dr. TRELEASE'S in Bost. Soc. Nat. Hist. **4**: 72 fixed the plant to which this name must apply. Specimens answering to this description are not rare in the herbaria and are always non-glandular and with the pubescence of the stem (whether sparse or abundant) more or less retrorse. The plant is always cespitose, growing in the form of a turf or mat from which short assurgent stems arise. The new characterization in the N. A. Fl. **25**: 15 would seem to be without warrant, and at best that description presents merely one of the variants of *G. Fremontii* Torr."

The Fendler specimen of *G. caespitosum* named by Gray is identical with the plant later described by Heller as *G. atropurpureum*, and there are numerous additional specimens from Arizona, Colorado, and New Mexico to match it.

Hanks & Small, and later Rydberg, applied the name *G. caespitosum* to a coarser, glandular-pubescent plant, which they attempted to segregate from *G. Fremontii* because of slight differences in foliar characters; but we now know that *G. caespitosum* sensu Hanks & Small is synonymous with *G. Fremontii*. Hanks & Small, as well as Rydberg, applied the name *G. atropurpureum* Heller to the slender non-glandular plant which is the true *G. caespitosum*.

[1] Nelson, A., & Macbride, J. Francis, Bot. Gaz. lv. 376 (1913).

Examination of a series of specimens shows that plants with pale petals often occur in this species, as well as the apparently more common deep purple-flowered form described by Heller as *G. atropurpureum.* The varying amounts of anthocyanin pigment in the petals are correlated, in all probability, with the metabolism of the plant. Hanks & Small (1907) called this species *G. gracile* Engelm.; but this name is untenable because it was previously used by Ledebour in 1837, and again by Schrenk in 1845.

17. G. LENTUM Wooton & Standley. Perennial, with a stout caudex; stems 20–60 cm. tall, slender, ascending or spreading, copiously glandular-pilose; petioles of the basal leaves 7–13 cm. long, glandular-pilose; blades 3–5 cm. broad, roundish in outline, 5-parted, the divisions rhombic to obovate, and with obtuse tips, densely hispidulous-strigose or glandular-villosulous on both surfaces; cauline leaves similar, 2–5 cm. broad; stipules lanceolate, attenuate, 3–7 mm. long, pilose; inflorescence axillary and terminal, cymose; peduncles 2–7 cm. long, densely glandular-villosulous; pedicels paired, 1–4 cm. long, densely glandular-villosulous; sepals oval, 7–8 mm. long, the outer ones glandular-pilose; mucro 0.5–1 mm. long; petals 8–10 mm. long, white, entire or emarginate, sparsely pilose about half their length; filaments ciliolate half their length; mature stylar column 2–2.5 cm. long, glandular-pubescent; stylodia 4–5 mm. long; carpel-bodies about 4 mm. long, puberulent and sparsely hispid; seeds 2.5–3 mm. long, finely reticulate.—In Contr. U. S. Nat. Herb. xvi. 142 (1913); Tidestrom & Kittell, Fl. Ariz. & New Mex., 131 (1941), ex p.—Mountains of Arizona, New Mexico, and adjacent Texas; Mexico. TYPE LOCALITY: West Fork of the Gila River, Mogollon Mts., Socorro Co., New Mexico. Specimens examined: ARIZONA: Johnsons Basin, *E. O. Wooton,* June 22, 1892 (UI). NEW MEXICO: West Fork of Gila, Mogollon Mts., *E. O. Wooton,* Aug. 7, 1900 (US, TYPE); Tortugas Mt., southeast of Las Cruces, Dona Ana Co., *E. O. Wooton,* Oct. 6, 1904 (US); Middle Fork of the Gila, Mogollon Mts., Socorro Co., *E. O. Wooton,* Aug. 5, 1900 (US); Rio Zuni, *E. O. Wooton,* July 28, 1892 (US); Craters, Valencia Co., *E. O. Wooton,* July 28, 1906 (US); Pinos Altos Mts., *E. L. Greene,* September 1880 (F). TEXAS: Chisos Mts., *C. H. Mueller* 8050 (F).

Tidestrom & Kittell (1941) have placed the name *G. lentum* in synonomy under *G. Wislizeni;* however, we regard *G. lentum* as a distinct species, growing in New Mexico and Arizona, and probably also in Mexico, although we have seen no specimens of it from the region south of the Rio Grande. *G. lentum* is easily recognized by its densely glandular-villous indument on the